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AUTHOR	Halstead, Kent
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ABSTRACT

The theory and procedures for measuring geographical differentials in cost of living, amenities, wages, and cost of government services are presented. These differences are important to individuals seeking optimal locations, and within groups seeking equitable treatment in locational assignments. Indexes for these factors are reported for 579 cities together with state averages. Spatial price differences for the goods and services purchased by families for everyday living are reported by a geographical Cost of Living Index. Four parts are as follows: (1) cost of living (cost index theory and guides for compilation, cost of living defined and nature of differences, cost of living pricing, and cost of living index compilation); (2) amenities (amenity concepts and theory and regional preference curves and amenity measurement); (3) wages (measurement of prevailing wages, equilibrium wages under pure competition, and prevailing wages and regional amenities); and (4) cost of public services (cost of government services index). Two appendices are regression analysis to predict consumption and home ownership costs and state and local government budget. Eight text tables are attached. Contains 43 references. (SM)

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GEOGRAPHICAL DIFFERENTIALS IN COST OF LIVING, AMENITIES, WAGES, AND COST OF GOVERNMENT SERVICES: THEORY AND MEASUREMENT

Kent Halstead

Note: All data in this text is illustrative. Final data tables to be reported in a subsequent publication.

Disclaimer: The observations and conclusions offered in this paper are those of the author. They should not be taken as representing the opinions or positions of the U.S. Department of Education or any of its components.

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Chapter 1. INTRODUCTION AND OVERVIEW

How much more does it cost to live in Boston than Atlanta? What difference in salary would make living in either city equally attractive? These questions, about any cities, arise because prices differ from one community to another and workers feel that salaries should be adjusted so that everyone on the same job, no matter where he lives, has the same purchasing power. Workers also recognize that differences in the quality of life are involved, and some additional adjustment in salary should be made to account for advantages in climate, work and recreation opportunities, and other living conditions.

What about wages? Which city has the highest overall wage level? Where are wages for individual occupations likely to be higher? Should employees be compensated if asked to move to a less attractive part of the country?

Together, measurement of cost of living, quality of life, and wages can identify significant geographical differences, of importance to families, firms, and the cities represented. Management and labor need such information to negotiate reasonable and fair wages. On retirement families are still concern about living costs and amenities. This study attempts to provide new geographical dimensions in these three areas--cost of living, amenities, and wages--of potential value to almost every citizen.

The universal concern in these matters stems from our common desire as citizens for equity--fairness in our wages, fairness in the quality of life we experience. This personal quest also extends to a civic concern for equity in provision of public services. Does a hundred dollars per pupil spent for education

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in Houston buy as much as in Boston? Since wages and other costs involved vary from city to city, equal public services cannot be provided unless expenditures are proportionally adjusted. The last part of this study presents such an adjustment factor using the wages and other price data reported in earlier chapters.

The public is not as familiar with the problem of geographical equity as the differences involved warrant. This is due in part to our being accustomed to measuring value or worth in nominal (face-value) dollars. However, consistent inflation has taught most consumers to recognize the eroding value of their real income over time as measured by the Consumer Price Index (CPI). And public attention will increasingly be given to geographical differences in the real value of wages and government allotments as this information becomes available and publicized.

Study Overview and Rationale for Geographical Indexes

This study seeks to advance public knowledge and use of geographical differences in cost of living, amenities, wages, and cost of government services. These differences are important to individuals seeking optimal locations, and within groups seeking equitable treatment in locational assignments. Indexes for these factors are reported for 579 cities together with state averages. A state summary is presented in Table A at the end of this chapter. Together the indexes provide tools useful to managers, employees, unions, citizens, and government officers for incorporating geographical differences in analyzing and establishing salaries and county, city, and state budgets.

Spatial price differences for the goods and services purchased by families for their everyday living are reported in this study by a geographical Cost of Living Index (CLI). Wages adjusted by the CLI are converted to dollars of equivalent purchasing power and are called real wages. Workers in the same job generally expect equal real wages. Government and other funding agencies seeking equitable allocations of family allotments may adjust benefit amounts by local costs of living. Wage earners and recipients of government funding disbursements should find the Cost of Living Index exceptionally useful in judging the equity of nominal amounts paid at different locations.

Workers also recognize that living conditions such as climate, schools, and housing vary from one residence location to another, and require some form of compensation if individuals are to feel fairly treated. These quality of life differences are measured and reported here by an Amenity Index (AI). Households seek that combination of payment and amenities which maximizizes their satisfaction. For a given occupation and

industry this payment is called the prevailing wage, and, in combination with local cost of living and amenities, establishes a package that residents prefer to the wage-amenity combinations of other locations in the same general region.

Prevailing wages are set by a community's supply and demand for labor. Governments also face this common labor market and must pay the prevailing wage if they are to successful compete for workers. Prevailing wages therefore are used to price the labor component of the Cost of Government Services Index (COGS), which reports the relative prices state and local governments must pay for the goods and services they purchase in providing public services such as education and police and fire protection. The geographical price differences for these items means that disbursements among cities and counties and Federal disbursements among states, do not have the same purchasing power and therefore do not equally respond to individual or community needs. Equal nominal allotments are simply inequitable in provision of public services geographically dispersed. The Cost of Government Services Index can be used to reduce such inequity.

There are other instances where a uniform system of wage payments is more suitable than dependency on the varieties of local prevailing wages. A single nation-wide firm and it workers may find equal pay for equal work more equitable, regardless of local wage rates. This means that all wages are proportional to the cost of living, i.e., equal real wages would be paid. In addition, workers may contend there should be some uniform adjustment, acceptable to all, for differences in local amenities. The resulting amenity adjusted equal real wages (also called "equilibrium wages" because this wage level is reached as firms near equilibrium under conditions appraoching pure competition[1]) is intended to establish roughly equivalent wage-amenity packages based on a formula rather than by local market action. This approach is most suitable when workers are

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[1] Adjustment for geographical differences in living costs and amenities can be supported by efficiency as well as equity considerations. When an industry pays wages adjusted for equivalent real value, labor and capital are more rapidly reallocated to their most productive uses with attendant greater consumer satisfaction and maximum wages. In areas where the adjusted wage is higher than the previous wage, firms will introduce more equipment which replaces some workers; where the adjusted wage is lower, firms will modify operations to require more labor and hire the displaced workers. The result will be greater overall productivity within the industry, equal equivalent pay to workers, and maximum earnings. Equal nominal wages within an industry, on the other hand, are, in an economic sense, artificial, increasing the market action and time required to reach equilibrium and optimal allocation.

frequently and involuntarily moved to locations other than those preferred.

Organization of Study and Brief Description

The study is organized to facilitate selective use. Readers intent on immediate use of the indexes need only familiarize themselves with the introductory material of this chapter. All tabular data are presented together a separate volume.

This text is organized into four parts--one for each of the major areas priced--Cost of Living, Value of Amenities, Prevailing and Equilibrium Wages, and Cost of Government. Certain secondary technical matters have been delegated to appendices.

The following chapter and appendices outlines and table listing provide an overview of the study for the casual reader.

Chapter 1. INTRODUCTION AND OVERVIEW

This study presents geographical indexes of cost of living, amenities or quality of life, prevailing and equilibrium wages, and cost of government services. Values are reported for 579 cities and state averages. This chapter explains how the study is organized and summarizes each chapter.

PART I. COST OF LIVING

Chapter 2. COST INDEX THEORY AND GUIDES FOR COMPILATION

To measure cost of living differences from one city to another, and cost differences only, rigid rules must be applied to the data collection and compilation. The overriding requirement is that both the quality and quantity of the goods and services priced at each location must be held constant, otherwise variations in consumption will be introduced which cause the indexes to reflect differences in personal tastes and availability of merchandise as well as prices. Indexes are unambiguous if they measure one thing and one thing only.

A second paramount rule is that to achieve broad and proper application, a geographical cost of living index should measure price differentials faced by "representative" consumer. Selected here is a middle-income home-owing family. The items priced consist of all the goods and service purchased by this type family including payments into retirement accounts, taxes, and contributions, as well as day-to-day expenditures for food, clothing, shelter, etc. Limiting pricing to too few items

distorts the true cost differentials which a using public attributes to cost of living measurements.

Chapter 3. COST OF LIVING DEFINED AND NATURE OF DIFFERENCES

Throughout the country there is great variation in the prices paid for goods and services purchased for day-to-day living. These differences are primarily due to variation in production and distribution costs including differences in the prices of materials and labor set by local supply and demand. A geographical cost of living index can be compiled of these differences based on field pricing at various locations. The "market basket" being priced must reflect typical family or other purchasing unit consumption, and should not very appreciably from one location to another. The items being priced and the conditions of sale must also be essentially the same at each location so that only differences in price are reported.

This study present a Cost of Living Index (CLI) using price data collected by American Chamber of Commerce Research Association and prices from other sources, applied to the budget of a typical "middle-income" family of three persons (two wage earners) living in their own home, as defined by the Bureau of Labor Statistics. Index values have been estimated for 579 cities and metropolitan areas and state averages. A primary use of these indexes is to adjust wages at different locations, and other payments such as retirement and welfare allotments, to achieve equal purchasing power.

The Cost of Living Indexes of this study, for 579 cities and state averages, are presented in Table 1. The cost of consumption and state income tax components are presented in Table 2. Consumption details of food, utility, transportation, health, and miscellaneous prices are presented in Table 3, plus property ownership costs. The details of property ownership costs are presented in Table 4. CLI values for the 1985-87 period range from an estimated low of 81 in Batesville, Arkansas, to a high of 128 in Anchorage, Alaska, and 124 in the New York City metropolitan area. Alaska has the highest average cost of living, 128; Mississippi the lowest average, 88. A state-level summary of values for the Cost of Living Index and three other indexes of this study is presented in text Table A.

Chapter 4. COST OF LIVING PRICING

Pricing the different items in the family market basket of purchases is the most difficult task in compiling indexes of living costs. An exception are price neutral items, such as payments into pension funds and contributions, which are indexed at 100 at all locations. Pricing in the other major budget

areas--taxes, consumption, and residential property--proves more difficult.

Since citizens generally do not derive the benefits of government expenditures proportional to their tax payments, taxes are view here as a reimbursable cost of living and included in the family budget. State general sales tax rates are applied to the prices of goods and services, other than food and drugs; state and local residential property taxes are included in the costs of housing; and federal and state individual income taxes, which are depended on income after adjustment for cost of living, are included by a special formula.

Purchases in the Consumption budget category--groceries, utilities, transportation, health care, and miscellaneous goods and services--are priced using data for 59 items collected quarterly for 224 cities by the American Chamber of Commerce Researchers Association (ACCRA). These data are presented in Table 3.

The price of housing is the major factor determining cost of living. Also, critical here, is the difficulty of measuring truly comparable costs. Separate pricing of site and house structure are necessary. In this study the site prices reported are median values representative of middle-income neighborhoods, for single family homes purchased or refinanced under the Federal Housing Authority, U.S. Department of Housing and Urban Development. While all sites are "middle-income" there are city differences in the quality of life present in each neighborhood. Such amenity differences are irreducible and retained in most cost of living measurements as a necessary cost element. (Amenity theory and measurement are presented in the second part of this study.)

Equivalent new house construction purchasing power is substituted for house prices in this study. The difficulty in pricing the physical structure component of residential housing is the requirement to hold design and material specifications constant. This problem is avoided by substituting equivalent new house construction purchasing power for existing house prices. The Dodge Building Cost Indexes report building tradesmen and material costs for 600 cities. These costs applied to a standard size house plus the builder's markup is used as structure prices in this study. While they may not equate exactly to existing house price differentials, their value lies in the uniformity of approach which precludes inconsistencies in existing house pricing.

The detailed costs of property ownership are presented in Table 4.

Chapter 5. COST OF LIVING INDEX COMPILATION

This chapter presents the mechanics of index compilation which involves five steps:

(1) compilation of Consumption costs as a weighted average using the ACCRA price data for approximately 210 city locations,

(2) compilation of Home Ownerships costs for approximately 240 locations using HUD site and Dodge Construction Cost data,

(3) combination of Consumption and Home Ownerships (C&H)costs, as a weighted average, for a core universe of approximately 150 common cities,

(4) from a regression of C&H costs for the core universe establish predictive equations for C&H costs for other city groups, and

(5) computation of cost of living indexes (CLI) for all city locations by combining actual and predicted Consumption and Home Ownership costs with federal and state income tax payments and expenditures price neutral items.

PART II: VALUE OF AMENITIES

Chapter 6. AMENITY CONCEPTS AND THEORY

Everyone recognizes how important location is to quality of life. On the broadest scale, regional location determines climate, general terrain features, urban-rural balance, nearness to mountains and ocean, etc. A step more detailed, city and rural location determines the quality of schools and other government services, access to cultural and other entertainment, job opportunities, and crime rate. On a still smaller scale, neighborhood and specific residence address will establish, commuting and shopping distances, view, neighbors, etc. These location-specific conditions we value are called amenities. In this study we are concerned only with public amenities, those of the type mentioned above whose value is totally dependent on location, and for which at least temporary access is available and free to all.

Workers and their family households are willing to trade positive amenities they prefer for a reduction in real wages. This tradeoff rate is called a "preference curve" or "preference schedule." The slope of the curve indicates whether the household prefers wages or amenities. Firms competiting in the area pay the competitive "prevailing wage," that is the wage set by local supply and demand. Thus the household preference curve is the relationship between real prevailing wages and local amenities.

Chapter 7. AMENITY MEASUREMENT

The relative value of living in different locations is reflected in the price differences consumers are willing to pay to reside in each place. To some extent local cost of living reflects the value placed on amenities. Workers desiring to live in attractive areas bid up residential lot prices. The value of adjacent commercial lots raises with responding parallel increases in construction costs, utilities, and eventually the prices of most goods and services. However local cost of living does not exclusively reflect the value placed on amenities. The most tangible direct evidence of this willingness to pay for location are residential site (lot) prices. In this study, the relative value of public amenities is estimated by the prices of residential sites for single family homes collected by the Department of Housing and Urban Development.

These lot prices are reported as an Amenity Index (AI). The data are reported in Table 1 with details in Table 2. An index of 60 means that the value of amenities (as measured by residential property site prices) is 60 percent of the U.S. average; an index of 120 means that amenities are valued 20 percent greater than the U.S. average. The range in AI values is from the low 20's for cities such as Anniston, Alabama and Columbus, Georgia, to highs of 361 for San Jose, California and 334 for Honolulu. This means that middle-income home buyers value the quality of life and job opportunities in the most attractive areas of this country 15 times more than then the value living in the least attractive areas.

PART III PREVAILING AND EQUILIBRIUM WAGES

Chapter 8. PREVAILING WAGES AND THEIR MEASUREMENT

The fairness of wages is in constant contention. Workers and management continually bargain wage rates for each occupation and skill level. Also bargained are adjustments for inflation to equalize yearly purchasing power. The Consumer Price Index, prepared by the U.S. Bureau of Labor Statistics, is used by management and labor in these negotiations as an accepted measure of inflation affecting the general consumer.

Recognized but seldom practiced in salary negotiations is the need to preserve geographical purchasing power. The principle is that employees performing the same job at different locations under similar working conditions should receive the same real wage (equal purchasing power). While this objective is appreciated, it is not practiced because no index for geographical price differentiation exists on a par with the CPI.

Cost of living indexes have had limited use in management labor negotiations,[2] however, such indexes are deficient for negotiation purposes because of their inclusion of amenities associated with location for which compensation is not normally required. Adjustment of equal real wages for the economic value of amenity differences results in an "equilibrium" wage, so named because these wage differences occur under pure competition as equilibrium conditions are approached.

Equilibrium under pure competition results in optimal resource allocation, profits, and wages. However sound the theory, equilibrium wages do not exist in practice because of imperfections in the labor market. Firms and workers have temporary advantages and disadvantages which cause local differences in supply and demand and resulting salary levels. Salaries so set in the local market are called "prevailing wages" and since firms must pay this level of wages to compete, they are a very important economic entity.

Prevailing wages are the mostly commonly discussed yet least reported of all wages. When workers in the same job and industry compare their wages they are talking about locational differences in their occupation's prevailing wage. When workers site the general "going wage rate" they are referring to the average prevailing wage common to many low skill occupations in the area. In every instance the occupation or group of occupations is fixed and the wage level is established by local supply and demand.

The geographical indexes of prevailing wages presented in this study report geographical differentials in wages for typical occupations in retail and service type industries. These types of occupations (small business administrators, supervisors, sales personnel, receptionists, clerks, waiters, barbers, etc.) generally have middle to low level education and training requirements. Many job seekers begin working for firms in these type positions. There is, consequently, a large labor pool and market for these occupations with competition establishing a fairly uniform threshold wage at each location. The prevailing wage indexes of this study report geographical differences in this basic wage for service and related occupations, common to

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[2] In 1967 a salary contract formula was signed between the 650,000 members of the Communications Workers of America, AFL-CIO, and the American Telephone and Telegraph Company using cost of living exclusively to establish wage differences between labor markets. See Robert R. Nathan Associates, Inc., Geographical Wage Standards for Reclassification of Work Locations in the Telephone Industry, Communication Workers of America, AFL-CIO, Washington, D.C., 1965.

many industries.[3] Because these wage differences are representative of many occupations they are used in computing the labor component of the Cost of Government Services Index (COGS) reported in Chapter 11.

Prevailing wages are set in each location by local supply and demand. Specifically firms offer wages consistent with the production advantages afforded by their location; employees accept wages consistent with their tradeoff preference between wages and local amenities including cost of living. This complex topic is discussed in Chapter 10. It is proceeded by a discussion in Chapter 9 of the simpler establishment of equilibrium wages under conditions of pure competition.

Comparison of prevailing real wages is most realistic within geographical regions having similar basic amenities such as climate, topography, industries, and city sizes. These regional markets are created because workers are more inclined to move within areas which exhibit the locational attributes they prefer. Comparison of prevailing wages in Arizona with those in Maine, for example, makes little sense if workers would not exchange locations for any added compensation.

The prevailing wages of this study are reported in Table 1.

Chapter 9. EQUILIBRIUM WAGES UNDER PURE COMPETITION

Wages adjusted for geographical differences in cost of living are called "real" wages, the nominal amounts then being reported in units of equivalent purchasing power. Equal real wages at any location are proportional to the area's cost of living. Wages may also be adjusted to maintain purchasing power over time, using yearly or monthly values of the Consumer Price Index. Again the adjusted values are called "real" wages since they represent real or true purchasing power from one period to another.

The local attributes or amenities of an area, as with cost of living, also affect wages. Households prefer living in attractive areas and are willing to accept some loss in pay as a tradeoff. In unattractive areas they expect added compensation. Workers sharing some common appreciation of amenities would expect that wages would be so adjusted. Thus for workers in the same job to be equally satisfied in various locations requires

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[3] It should be noted that each occupation within each industry may exhibit different geographcal wage patterns. These specialized wage schedules are of value only to the group represented. The more representative prevailing wages of this study have much broader usage.

that nominal wages be adjusted for both cost of living and the value of amenities (a wage reduction in attractive areas, a wage increase in unattractive areas). Wages so dual adjusted are called "equilibrium wages" for such wages would occur naturally under conditions of pure competition as equilibrium is approached.

Equilibrium wages occur as a stable position is reached under conditions of pure competition. The equilibrium concept is important, not because equilibrium is ever in fact attainable, but because it shows us the direction which economic changes proceed toward greater efficiency. Equilibrium results in a "correct" allocation of any given labor resource which places all workers in their highest paying and most productive employments. This allocation results in maximum wages and net national product, and minimal worker transfers; all desirable objectives.

In a single national labor market, with highly informed and mobile homogeneous workers and free movement of capital, i.e., a purely competitive market, all wages would eventually be set to provide equal satisfaction to each worker (household) and equal productivity to all firms. This status of equilibrium would be brought about by workers continuing to move to obtain a more satisfying package of real wages and local amenities. Firms or capital also would transfer until further movement would result in no additional gains. The resulting equilibrium wages would consist of equal real wages plus an adjustment for differences in the value of amenities based on the wage-preference tradeoff shared or agreed upon by all workers. This chapter explains how this common wage comes about under conditions of pure competition. In Chapter 10 the additional complexity of distinct worker preferences for amenities and reduced worker and capital mobility is introduced resulting in "prevailing wages."

The Equilibrium Wage Index (EWI) presented in this study reports equal real wages adjusted for local amenities. Table 1 presents the city and state average data. The cost of living and amenity components are presented in Table 2. These wages are most applicable within a national firm involuntarily locating workers at many locations. When workers are free to locate where they prefer no adjustment for amenities is normally required. However, within a large firm, permanent employees may well note differences in amenities between their residence and the location of other employees and request some compensating adjustment. They must, however, agree on a broadly acceptable valuation of amenities. Thus the introduction here of resident lot or site price as a universal indication of location value. Keep in mind that equilibrium wages may be above or below local prevailing wages, and, in negative instances, employees may seek other employment.

To illustrate the adjustments under a negotiated contract calling for equilibrium wages, consider the following example. A firm with 100 employees in a given occupation is located in three cities with equilibrium wages as follows: city A, 30 employees, EWI 85; city B, 25 employees, EWI 110; and city C, 45 employees, EWI 128. The firm's average salary for the occupation is $25,000. The formula to be used states that the firm's total salary for all employees equals the sum of the salary sub-totals for each city, with city salary ratios proportional to EWI levels, viz., 85:110:128.

$$30\ (.85\ Y) + 25\ (1.10\ Y) + 45\ (1.28\ Y) = 100 \times \$25,000$$

where Y = salary for EWI =100 $\qquad Y = \$22,604$

Salary city A, EWI adjusted equals .85 x $22,604 = $19,213
Salary city B, EWI adjusted equals 1.10 x $22,604 = $24,864
Salary city C, EWI adjusted equals 1.28 x $22,604 = $28,933

Chapter 10. PREVAILING WAGES SET BY AMENITY PREFERENCES

In the real world no single market exists for all workers. Neither are they homogenous as required by the pure competition model used to illustrate equilibrium wages in the previous chapter. Workers, or more particularly their households, have distinct preferences with regard to quality of life factors. This difference in the value attached to amenities means that families have different real wage-amenity tradeoffs or preference schedules. The interaction of these unqiue preferences curves for the residents in a community establish the supply of labor. The demand is similarly established by the production advanatages provided the collective firms by local product, raw materials, labor, and other markets. The resulting intersection of supply and demand establish the "prevailing" wage in an area. How these supply and demand curves are established is presented in this chapter. The nature and measurment of prevailing wages has previously been presented in Chapter 8.

Amenity differences (for the same bundle of attributes) across cities for workers (households) in the same occupation and having the same general amenity preferences should be reflected in real wage differences if there are no interferences with the market mechanisms. This relationship is shown in Figures 8 and 9 of Chapter 7. Firms in regions with similar production advantages will offer equal nominal wages regardless of variation in the amenities faced by their workers. Households, in turn, will locate where the real wage-amenity tradeoff most suits their preference. In rural areas of low productivity, firms can compete only by paying offsetting low labor rates. Workers will chose these low wages only if there are offsetting amenities which they value. In the long run, real wages differences will

continue to persist (prevailing real wages), consistent with the need to compensate workers at each employment level for differences in amenities and cost of living. Persistent prevailing real wage differentials reflect differences in amenities and household preferences along an aggregate acceptance-wage schedule for each location.

PART IV: COST OF PUBLIC SERVICES

Chapter 11. COST OF GOVERNMENT SERVICES INDEX

The Cost of Government Services Index (COGS) reports market prices and EWI adjusted wages that state and local governments would negotiate for a fixed basket of goods and services purchased annually for the current operation of their collective public human services. The index may be used to adjust state and local government revenues and expenditures for the designated public human services to establish equivalent purchasing power. For example, appropriated funds for public higher education per student adjusted by COGS are comparable state-to-state in purchasing power. State values of COGS range from a high of 117 for Alaska to a low of 92 for Mississippi. The index values are reported in Table 1.

APPENDICES

Appendix A. REGRESSION ANALYSIS TO PREDICT CONSUMPTION & HOME OWNERSHIP COSTS

This appendix presents the regression analyses which develop the formulas to predict cost of living for locations without complete data. Cost of living is based on costs of home ownership--site plus structure--and the costs of consumption. These three data elements are available only for a "core universe" of 150 cities. Based on the regressions presented, formulas are developed to predict cost of living for 60 cities using only structure and consumption costs; for 90 cities using only site and structure costs; and for 260 cities using only structure costs. The level of accuracy of these projections is obviously less than for values of cost of living determined from complete data.

Appendix B. State and Local Government Budget

This appendix explains how the state and local government budget used for the Cost of Government Services Index was developed. The budget presents a distribution by object classification for pricing purposes. The weights employed are: government employed labor, 76%; outside contracted services, 8%;

energy, 5%; consumer type goods and services, 9%; and nationally priced items, 2%.

TABLES

The indexes reported are estimates[4] for cost of living, value of amenities, prevailing wages, equilibrium wages, and cost of goverment services are presented for cities and urban areas in Table 1 with component details in Tables 2-4. State indexes are presented in Table 1 and summarized in text Table A, Chapter 1. All indexes are based on a city and state population weighted averages, excluding rural areas, relative to a U.S. urban population weighted average equal to 100. The U.S. index of 100 thus represents the actual national urban average value or dollar amount involved.

The indexes are reported for neighborhoods within the city limits, but outside the city core, and in adjacent suburbs; for metropolitan statistical areas (MSAs) and other cities and urban areas. The data are for calendar year 1987. The indexes measure geographical differences at a point in time, and are fairly stable compared to a time series such as the Consumer Price Index (CPI). Updating can be performed yearly.

The indexes have been compiled from the best data currently available. Their accuracy, judged by the author on the basis of soundness of model design and adequacy of data, is deemed "reasonable" for trial use. The magnitude of the observed geographical differences affecting living costs and general living conditions is severe, so severe, that immediate adjustment, though possibly flawed, is likely to still improve the overall equity of wages and other applications and is therefore warranted.

The direction and general magnitude of a majority of index values is believed correct. However, caution should be exercised in rigorously interpreting minor deviations from national averages or among individual locations.

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[4] The city indexes are reported on four accuracy levels: #1--index compilation based on complete Consumption and Home Ownerships (C&H) costs (152 cities); #2--prediction of C&H costs by a regression estimation equation with standard deviation of 2.7 index points (61 cities); #3--prediction of C&H costs by regression estimation, standard deviation 3.9 index points (92 cities); and #4--prediction of C&H costs by regression, standard deviation 5.4 index points (276 cities).

Table A. State Indexes of Cost of Living, Amenity Value, Equivalent Wages, Prevailing Wages, and Cost of Government Services, 1987.

State	Cost of Living	Amenity Index	Equilibrium Wages	Prevailing Wages	Cost of Gvt Srv
Alabama	90	94	93	92	91

PART I. COST OF LIVING

CHAPTER 2. COST INDEX THEORY AND GUIDES FOR COMPILATION

Indexes of the prices or "costs" to the buyer of goods and services, whether a time series such as the Consumer Price Index (CPI) or across geographic boundaries, as a Cost of Living Index (CLI), involve theory and concepts which require explanation. Also, if the indexes are to be used properly, the assumptions made and limitations involved should be recognized.

This discussion is limited to indexes which measure differences in prices at various locations, i.e., geographical or spatial series price indexes. Inter-temporal indexing of prices have a very special set of problems unique to time series which are outside the scope of this presentation.[1]

An index number measures changes or differences in prices, wages, employment, and the like by showing the percentage variation from an arbitrary standard, usually 100, representing the status at some earlier time or typical condition. A geographical cost index measures the average differences in the prices of goods and services purchased by a particular group of consumers at different locations. The amount and quality of the selected commodities that comprise the market basket being indexed must remain constant at each location. Under these restrictive conditions, the cost index (in actuality its reciprocal) is a measure of the relative purchasing value of money at each location.

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[1] A pervasive problem, and central to much of the controversy surrounding time series price indexes such as the CPI, is the difficulty of "holding the market basket fixed" each year so only pure price changes are measured. For consumers, both the quantity and quality of items purchased, as well as the amount spent on each, tend to change. Goods once included in the budget may no longer be needed. Items previously not in existence may have been added. Some items may be substituted for others. Changes of this kind must have no effect on price index values measured over time. The general tactics employed to overcome these discontinuities, within limits, is to factor out the price differences due to the substitution of new products. In cases where the quality of products is improved, only changes in prices that are attributable to associated research and higher production costs are reported.

For an introduction to this literature the reader is refereed to Fisher and Sheil, Gilbvert, Halstead, and Hoover, cited in the bibliography.

Cost index design and computation require a number of assumptions to derive practical measures. Initial assumptions are made in choosing the form of the index. Others are necessary to accommodate real world conditions and measurements that do not always meet theoretical requirements. The totality of these assumptions constitute the index theory. From a practical standpoint, they guide or are the "rules" for index compilation.

The assumptions pertaining to the Cost of Living Index presented in this study have been organized in three categories: general index theory, market basket construction and weighting, and price series. Each assumption statement is followed by explanatory commentary including justifying conditions.

GENERAL INDEX THEORY:

#1. A useful and practical definition of cost of living is based on the price of a fixed market basket of goods and services as opposed to the price of a fixed level of consumer satisfaction.

A fundamental distinction in price index purpose is stated in the question, "Should indexes reflect prices of units of goods and services fixed at the point of transaction, or should it attempt to measure price variations which provide the same level of utility or satisfaction that consumers expect to derive.

The first approach reports the prices of goods and services as per contract between the buyer and seller, since this is the only point at which the value of purchases is settled and measurable. The second approach attempts to report, as a lower price, any increase in consumer satisfaction brought about by improvements in product quality. The idea is to substitute a measure of benefit for the item unit in which the transaction is made. Tires, for example, could be priced on a cost-per-mile basis rather than the price per tire. An index using this approach reports the change in total money expenditure a consumer must make to maintain a constant level of utility from the purchase of a variable group of products.

Unfortunately, only prices can be precisely measured, not satisfaction. The idea of substituting an estimate of benefit for the item unit price must necessarily introduce subjective judgment. In some instances this estimate may be fairly straight forward as in our tire millage case above. However, if only esthetics were involved, the additional benefit would be hard to gauge. In a geographical context, equal consumer satisfaction at various locations, however attractive the concept, cannot be "priced" in any systematic manner, and must at present be rejected as a feasible approach.

#2. The Laspeyres-type, or fixed weight, formula is required as opposed to the Paasche, or variable-weight, methodology for computing geographical price differences at any given point in time.

In a fixed-weight cost of living index, the relative weights of goods and services being priced are held constant for all locations. This methodology accomplishes the purposes of a geographical cost of living index which must report only price differences, not variations in consumption patterns. Note that when significant changes in the composition of the market basket occur over time, item weights are revised (see rule #7). Note also that differences in the varieties of goods and services and their substitution is handled under rules #10 and #11.

The Paasche-constructed index varies the weights of items being priced according to the different preferences of consumers at various locations. An index so constructed thus reports both the effects of geography and consumer tastes. This methodology is therefore unsuitable for the exclusive measure of cost differences due to location. Note that index weights are adjusted over time in Paasche fashion to account for changing consumer tastes, etc. (see rule #8).

#3. Significant meaning can be conveyed by appropriately indexing to a suitable base measurement.

Price indexes are generally "indexed" relative to a United States average equal to 100. Care in selecting the nature of this 100 value can impart significant meaning to all index values. In the context of this study population weighted indexes are superior to indexes based on a simple numerical city average. Thus a population weighted cost of living index of 120 means that costs are 20 percent higher than those paid by the average United States resident. An unweighted index of 120 reports costs 20 percent higher than paid in the average of all cities.

In compiling composite indexes it is important that each subindex involved be measured on the same base, i.e., either weighted or unweighted. In other words, indexes to be summed must be related to the same base definition for 100.

MARKET BASKET CONSTRUCTION AND WEIGHTING:

#4. To be relevant to the general population, the market basket of goods and services to be priced should represent the purchasing pattern of a representative American consumer.

The consumer unit selected for this study is the home owning urban family (two employed adults and one child) which generally represents the living and consumption conditions of most Americans prior to retirement. About 84 percent of the U.S. population reside in a family (related individuals living together) status. Children are present in half these families. Of the occupied non-seasonal housing units (including apartments) in the U.S., 64 percent are owned by the occupant.[2]

The purchasing pattern of other consumer units such as single individuals and retirees, will differ from that of the national average pattern selected. In fact no two consumers have exactly the same buying pattern. However, national indexes, in representing average conditions for a representative consumer, report price differences generally experienced by a wide segment of the population. This is because the majority of consumers have similar requirements for food, shelter, transportation, entertainment, etc., and many goods and services and their substitutes experience similar relative price differences at various locations.

#5. To fully reflect costs of living, the market basket priced must include items representing all the basic goods and services purchased by the consuming unit.

Cost of living implies to the general public inclusion of costs for all basic needs. This is a normally expected consumption pattern for day-to-day living. Extravagant and luxury items rarely purchased are not priced since they are atypical and do not represent consumption for which reimbursement is deemed necessary by either employers or employees. This rule is more important in adding items than its exclusionary role. Of particular importance is inclusion of price neutral items such as Federal income taxes, retirement payments, and contributions, which tend to moderate cost differentials.

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[2] Bureau of the Census, Statistical Abstract of the United States, 1989, U.S. Department of Commerce, Washington, D.C., Tables No. 44 and 58.

#6. Market basket items may be weighted according to budget proportions as a perfect substitute for actual physical count.

Rather than conduct a difficult physical count of the set of goods and services being priced, budget proportions expended for each category represented may be substituted without error. So long as the original physical count proportions do not change, original budgets may be used without change in succeeding years.

#7. Variations in weighting result in minimal differences in the overall index series.

Index validity depends primarily on selecting geographically comparable price series. Slight variation in the weights attached to expenditure categories have little effect on relative index values. This is due to the fact that location tends to have a fairly uniform affect on the prices of a wide range of goods and services, creating overall price differentials relatively independent of the precise mix and proportion of goods and services involved. Thus holding budget weights constant from one location to another is more important in obtaining comparable geographical cost estimates than is selection of the exact basket composition.

#8. When consumer purchasing patterns change, new weights must be substituted if the geographical cost index is to reflect price differences for the current mode of living.

New products are constantly introduced and old ones discontinued. Consumer needs and preferences change. Also the budget share devoted to different items depends on their individual rates of inflation. The result is a constantly changing market basket, both in content and proportions. To account for these changes the market basket priced for a geographical cost of living must be kept up to date.

Note that a change in index weighting introduces a discontinuity, although slight, in the time series. This introduces some ambiguity into inter-city trend analysis. However, inter-temporal comparisons are of secondary importance compared to the central purpose of establishing geographical differences at a single point in time.

PRICING AND REQUIREMENT FOR CONSTANT QUALITY:

#9. Goods and services to be priced may be limited by selecting items representative of general categories.

Family living requires the purchase of many hundreds of different goods and services. All cannot reasonably be priced. Many items involve such a small portion of the budget as to be inconsequential. Other similar and near substitute items experience similar price differences which may be represented by the price series for a single typical item within the group.

Items "best" represent a category of goods or services if they constitute a major dollar component of the category's budget, serve as a near substitute for other items within the category, and exhibit relative price differences similar to the average for the group. Few items are selected this rigorously. Most are chosen because they are common purchases such as tooth paste or bread, which may, or may not be representative of all the toiletry and bakery goods they represent.

#10. Both the quantity and quality of the goods and services priced must be held constant at all locations at the time of pricing.

The single purpose of a cost of living index is to accurately reflect price differences and price differences only. To achieve this objective the goods and services being priced must remain essentially fixed in quality and quantity at each location at the time of pricing. (It is permissible, even necessary, for the goods and services to change over time, but not at the instant of geographical pricing.)

Many difficulties are encountered in imposing this rule. Living styles, personal preferences, and availability of items, vary from location to location resulting in different buying patterns for even some of the simplest of goods and services. More complex items such as houses vary in design and construction and neighborhood amenities, making the pricing of constant quality extremely difficult.

For simple items, fixed quality and quantity is assured by pricing national brand named products. Adherence to carefully prepared specifications generally is sufficient to hold constant the more complex features of services. No guidance is sufficient to hold housing conditions constant and special rules must be followed (see #11).

Climate and topographical conditions may require consumers to consistently purchase certain goods and services which deviate

from the national average buying pattern. Minor differences such as variation in clothing requirements would have no appreciable affect on index values and can generally be ignored. Variation in heating and air conditioning costs can be substantial and should be included in cost of living compilation. This is accomplished by not only including price variations in this budget component but also load variation.

Differences in costs attributable to variations in life styles and product availability are usually avoided in index compilation. Consumers may, for example, substitute rice for bread if it is less expensive and a local favorite. Inclusion of such variations greatly adds to the complexity and ambiguity of any cost index. It is simpler to minimize these possibilities by selecting common essentially homogeneous items for pricing whenever possible. Excursions from these standards are largely ignored under the assumption that all substitutes are equally satisfying to the consumer.

#11. Price difference due to special local requirements or market conditions which necessitate or compel purchase of non-standard goods and services are fully reinburseable as necessary costs of living.

In some communities, goods and services meeting pricing standard specifications may not be readily available. The consumer is essentially forced to purchase, at perhaps additional cost, these deviant items. For example, in some states state and local regulations require that all new automobiles meet certain safety and emission standards. In dry forest areas local construction codes may requires house roofs to be fireproof. Most prevalent of all, residential lot sizes may vary due to zoning ordinances, historical precedent, city boundaries, etc.

In all of these instances, the consumer has little or no choice other than to purchase what is available. Thus a "required" purchase must be substituted for the item of standard specification. Since purchase of the variation is non-voluntary, any additional value accruing to the consumer may not be proportional to the added price. Under such conditions of forced purchase, price differences attributable to product variation beyond the control of the individual consumer are fully reinburseable.

On the other hand, if standard goods and services are available and the consumer chooses other qualities or additions, any added cost is not reinburseable. Free choice implies that the buyer equates benefits with cost.

Families that initial choose and later elect to remain in a given location derive benefits (amenities) which they believe

worth certain difference in locational costs. Such added costs, as an elected purchase, generally should not be included in cost of living adjustments. However, site prices which reflect the value of these amenities, have traditionally been included in cost of living measurements. The reasoning being that conditions of employment force many households to live within reasonable commuting distances, hence locational costs are largely involuntary and reinbursable. Indexes so defined should be accompanied by a clear statement that no adjustment is made for variation in location-specific amenities.

#12. Pricing goods and services is extremely sensitive to a variety of conditions, other than the nature of the item itself, which must be held constant if comparable values are to be obtained.

Other than the product or service itself, factors which must be controlled to establish equivalent pricing include conditions of sale, date of sale, and type and location of commercial establishment involved. The conditions of sale such as a discounted price for quantity purchases or a sale price on a given day must be avoided. The items must be purchased at every location on essentially the same day, at a time of year which is not especially advantageous to any particular location.

The type and size of the establishment where the transaction takes place must be similar at all locations. Most important, the physical location of the commercial enterprise involved must be within and central to the geographical area being represented.

Chapter 3. COST OF LIVING DEFINED AND NATURE OF DIFFERENCES

Prices of the goods and services purchased for every day living vary substantially across the country. Consumers are aware that it generally costs more to live in urban than rural areas, and they know that living in cities like New York and San Francisco can be very expensive. They also know that some firms "adjust" wages for cost of living and this makes sense because equal pay, in terms of real purchasing power, should be received for equal work. But much beyond these generalities, there is little public knowledge of the differences in cost of living that actually exist and how important such adjustments can be in achieving fair compensation.

This chapter presents a general discussion of the nature of cost of living measurement including the currently published data, the use and value of such indexes, a working definition of "cost of living" suitable for establishing geographical differences, and observations on the differences which emerge.

Currently Available Services

What most people know about cost of living comes from their experience with the Consumer Price Index (CPI). The CPI, reported monthly by the U.S. Bureau of Labor Statistics, measures differences in the prices families pay for living costs over time, that is, from one month or year to the next. When the Consumer Price Index rose from 109.6 in 1986 to 113.6 in 1987, this 3.6 percent increase was transformed into millions of dollars of additional earnings for employees whose contacts included an "escalator clause" adjusting salaries for inflation, and for retirees whose benefits are tied to prices by a COLA (Cost of Living Adjustment) agreement.

In contrast to this wide use, adjustment of wages and benefits for geographical differences in cost of living is relatively rare.[1] The most serious handicap is that there is no official Federal geographical counterpart to the CPI. The last Federal documentation of geographical price differences was the Department of Labor's "Urban Family Budget," discontinued after

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[1] A notable exception was the contract negotiated between the American Telephone and Telegraph Company and the Communications Workers of American in 1974, and again in 1983 and 86. This contract, affecting all union represented workers, stipulated geographical cost of living adjustments for four zones based initially on a formula developed by Robert R. Nathan Associates, Inc. See bibliography for citation.

1981.[2]

Currently the only publicly available data on living cost differences in popular use, is the 59-item price series for 224 cities published quarterly by the American Chamber of Commerce Researchers Association.[3] ACCRA employs an extensive volunteer survey network which collects price data in five groupings: groceries, utilities, housing, transportation, and miscellaneous goods and services. Other than housing, these prices are used in compiling the cost of living indexes of this study. Dependency on these data is fully acknowledged. However, ACCRA does not report differences in total living costs by including taxes, nor do they exercise the control over housing prices believed necessary for other than specialized application. The detailed use of the ACCRA data is discussed in a later section.

Also available, but limited to clients, are the special pricing services of Runzheimer International,[4] management consultants for travel and living cost. Runzheimer maintains a worldwide network of primary information sources providing access

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[2] U.S. Department of Labor, Bureau of Labor Statistics, Autumn 1981. "Urban Family Budgets and Comparative Indexes for Selected Urban Areas," News, April 16, 1982, Washington, D.C. For further details see U.S. Department of Labor, Bureau of Labor Statistics, Three Standards of Living for an Urban Family of Four Persons, Spring 1967, Bulletin No. 1570-5, Washington, D.C., and other reports in the series.

The BLS urban family budgets, begun in the early 1970s and continued through 1982, produced the first and only available basis for inter-area comparison of living costs. The budgets proved to one of the most popular and widely publicized series in the repertoire of labor statistics. The project officers, most notably John Rogers, Kathryn Hoyle, and Charles Wallace, deserve special recognition for their creative contribution upon which much later work has been dependent.

Because of its now obsolescence and limited coverage (only 40 major cities), the BLS intermediate family budget is of only theoretical value in developing a current index series.

[3] See American Chamber of Commerce Researchers Association, Inter-City Cost of Living Index, Louisville Chamber of Commerce, Louisville, Kentucky. Inquiries should be directed to either C. A. Kasdorf III, Houston Chamber of Commerce, 1100 Milam Bldg., 25th Floor, Houston, TX 77002, or Edward Sturgeon, Lexington Area Chamber of Commerce, 421 North Broadway, Lexington, Kentucky 40508.

[4] Runzheimer International, Runzheimer Park, Rochester, Wisconsin. Information on the Runzheimer's standard costing systems can be obtained from Wallace J. McDonough, Executive Vice President, Living Cost Division.

to reliable cost of living data for locations across North America and most foreign countries. The derived costs are formulated using all the major expenditure categories including taxation, savings, contributions, and life insurance.

Rationale for Study

The argument favoring collection and publication of geographical cost of living indexes rests on the principle of equity. Members of society have essentially the same physical and psychological need for the basic goods and services required for typical living. In a democratic egalitarian society the basic needs of all workers should be uniformly met. This is accomplished by equal payment in real purchasing power for equal work. Wages so adjusted are called "real" wages, and equal real wages for each job at every location is a large step in the direction of greater equity.

The Cost of Living Indexes (CLI) reported in this study respond to two current unmet needs:

(1) The indexes estimate total living costs, for typical urban middle income home owning families, with sufficient validity to serve as a reasonable geographical wage adjustment factor.

(2) The model employed includes regression to predict cost of living for an expanded universe of cities and urban areas sufficiently large to be aggregated as reasonable state averages.

Other features of the indexes include exclusive use of secondary data which allows public distribution of the findings at a nominal cost; provision for yearly updating; and the capacity for periodic reweighting the priced budget in response to changes in family buying patterns.

The remainder of this chapter describes the nature of the geographical cost of living indexes presented in this study. The first section defines the cost of living indexes reported, including the detail of each component; the second section discusses why the resulting geographical differentials may be less than expected, which also provides further incite into the nature of living cost differences. The details of selecting the various price series and index compilation are left to Chapter 4.

COST OF LIVING DEFINED

This study develops a geographical Cost of Living Index (CLI) for families. (Note that the Consumer Price Index (CPI) is similar in reporting family costs, but designed to measure differences in living costs over time, not geographical or inter-spatial.) The CLIs of this study are reported for 579 metropolitan areas and cities, and state averages (Tables 1 and 2).

The CLI is an estimate of the relative budget or total cost in different metropolitan areas and cities[5] in 1987 required for purchases of a fixed market basket of goods and services (including mortgage payments, taxes, and savings), typical of the expenditure pattern of an average family homeowner living in a representative "middle-income" neighborhood with varying local amenities. This definition includes six major elements:

Family Homeowner

The Cost of Living Index is based on the budget of the "urban family homeowner," defined by BLS as a family of two employed adults and one child under 18 years old living in their own existing home. Family earnings equalled approximately $40,000 in 1987. The principle respondent is college (46%) or high school (54%) educated. The family owns two automobiles.

"Middle-Income" Neighborhood

The cost of living indexes of this study include annual mortgage payments based on separate pricing of the residential lot and house structure. Lot or site prices are median values for houses financed by FHA loans for families with median incomes of approximately $38,000 in 1987. They are located 65 percent within the city limits but outside the city core, and 35 percent in the surrounding suburbs. The sites represent locations typically purchased by middle-income families. Although the neighborhoods in each jurisdiction are all "middle-income," they are not of equal quality in terms of local amenities.

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[5] The CLI and other indexes of this study apply to metropolitan statistical areas (MSAs) and other cities and towns of population generally over 10,000 residents. Almost three-fourths of the U.S. population is urban as opposed to rural. Based on county population, the 579 metropolitan areas and city CLIs of this study represent a population of approximately 182 million or roughly 80 percent of the 1987 total U.S. population.

Local Amenities

The quality of life or local amenities of "middle-income" neighborhoods varies greatly throughout the United States. Variation in residential lot prices are the only tangible standard evidence of the value residents attribute to these differences. The cost of living indexes of this study include these site cost differences as necessary to allow a consumer to "buy into" a middle-class neighborhood. The element in location to be fixed for pricing purposes is not consumer satisfaction, it is rather purchasing power to secure a fixed "middle-income" location. As the location attributes of "middle-income" neighborhoods vary greatly across the country, so also do family satisfaction with these amenities. Interpretation of this satisfaction is subjective and outside the realm of pure cost measurement and is therefore excluded from cost of living measurement.[6] (Amenities are separately defined and used for wage adjustment, see Part II).

Expenditure Pattern

The "typical goods and services" purchased by middle-income family homeowners and priced by the CLI are shown in Table B.[7] While not all items purchased are included, pricing the major categories cited provides acceptable representation of all the items involved. Extravagant and unusual or seldom purchased items are not considered "typical" or "required" for living and are excluded.

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[6] Equivalent housing satisfaction requires considerable judgement as to the characteristics of alternative sites and physical structure packages which a specifically defined family might find equally acceptable. For upper-income families, the cost of "equivalent" quality housing in high priced areas is often disproportionately greater than are the price differentials of other goods and services. Cost of living indexes which attempt to maintain high quality living styles are likely to exhibit a greater range of values than the indexes of this study.

[7] The pattern is predominately that of urban homeowners within incomes $30,000 to $40,000 interviewed by the BLS Consumer Expenditure Interview Survey, 1987. However, more exact data on homeowner mortgage costs and Federal tax liability for families in this income bracket are available from the Department of Housing and Urban Development and the Internal Revenue Service. These revisions, cited in the footnotes of the table, are believed to improve the data validity over the "expected recall" amounts obtained in the BLS Survey.

Table B. REPRESENTATIVE FAMILY BUDGET, 1987

Average Annual Expenditures of Urban Homeowners with Incomes $30,000 to $40,000 by Item, 1987. Consumer unit consists of 2 earners and 1 child under 18. Amounts and percentages exclude # identified items not priced.

Item		Amount	Percent of total	Price Source
Total expenditures and taxes		$32,336	100.0%	
DEFERRED BENEFITS		$4,256	13.2%	
Pensions & life insurance	$3,384			*
Contributions	872			*
INDIVIDUAL INCOME TAXES		$5,584	17.3%	
Federal income tax[1]	$4,700			*
State & local income tax	884			ACIR
(# Other state & local taxes[2] $96 excluded)				
HOME OWNERSHIP		$5,001	15.5%	
Mortgage interest[3]	$3,381			HUD &
principle[3]	756			Dodge
Property taxes[3]	661			HUD
Insurance	203			SFarm
(# Maintenance $365 excluded)				
CONSUMPTION		$17,495	54.0%	
1. Food at home (groceries)	$2,825		8.7%	ACCRA
2. Utilities[4]	2,451		7.6%	ACCRA
3. Transportation	5,109		15.8%	
Auto finance	$2,787			*
Insurance	474			SFarm
Operation-maint[5]	1,411			ACCRA
Public trans	437			ACCRA
4. Health	950		2.9%	ACCRA
5. Other[6]	6,160		19.0%	
Apparel	1,398			ACCRA
Food away	1,238			ACCRA
Entertainment	1,441			ACCRA
Personal & misc[7]	1,685			ACCRA
Other lodging	398			*
(# House furnishings & operations $1,603 excluded)				

Table B footnotes

* Considered geographically price neutral in CLI compilation.

\# No price series available. Item dollar amount excluded from budget and not included in computation of subtotals, percentages or CLIs of this study. Total of excluded items comprise 6 percent of the overall budget.

1 With an income level of $35,000, the BLS CE survey amount of $3,081 for Federal income taxes is low in comparison with IRS data. For this income level a U.S. Department of the Treasury tax liability of $4,700 for a married couple with dependents is substituted.

2 Mortgage and property tax payments of $6,139 for one-family home cases insured under the Federal Housing Administration (HUD) is substituted for the BLS consumer survey estimate of $5,683.

3 Other state and local taxes affecting families reported here include selective sales taxes other than on motor fuel, certain license taxes, and estate and gift taxes.

4 Utilities include heating gas and oil, $592; electricity, $985; telephone, $651; and other, $223.

5 Because of the recent sizeable change in gasoline prices, this component of operating costs has been reduced by the 1987/1984 CPI gasoline price ratio equal to .575.

6 State sales taxes are applied to the items in this category.

7 Includes personal care, reading, education, tobacco, alcoholic beverages, and other miscellaneous personal items.

Source: "Consumer Expenditure Survey Results From 1984," News, and detailed computer printout, Bureau of Labor Statistics, United States Department of Education, June 22, 1986. FHA Homes 1987, U.S. Department of Housing and Urban Development. U.S. Department of the Treasury, unpublished effective tax rates for selected income groups.

No account is made of individual preferences or local required or alternative items which may vary purchases from this standard composition. The items selected for pricing, however, are so common and basic, e.g., toothpaste, that substituiton is unlikely. Yet it should be noted that the composition detail of the basket for less basic items is likely to vary significantly across the country. Large segments of the population exhibit different life styles, living requirements, and buying opportunities, all affecting their purchases. People eat different foods, enjoy different recreational opportunities, and buy different clothes, depending on their environment. For purposes of price index compilation, such substitutions are assumed to have no affect on overall consumer satisfaction. If only a small proportion of the budget is subject to substitution, the price differentials are slight, and similar satisfaction is derived, the overall effect on cost of living is negligible. No adjustments of this type have been made.

Budget

The representative budget in Table B reports national averages in family total expenditures for consumption, i.e., purchases for day-to-day living; mortgage payments and other costs of home ownership; individual income and property taxes; and payments into pension funds and contributions where the benefits are deferred or intangible.

The expenditures are all periodic, that is they recur regularly as opposed to single or infrequent major purchases. They thus exclude large single investments such as the downpayment on a house or car (but include monthly mortgage and auto loan payments), and occasional exceptional costs such as large medical expenses.

Each of the item categories has its own share of expenditures or "budget proportion" indicating the relative importance of the item in the total family budget. The proportions are national averages based on the Bureau of Labor Statistics' "Consumer Expenditure Survey" (see Table B Source). These proportions are used in constructing the Cost of Living Index as index component weights. The weights are presented in Table C. They are fixed for all locations, and multiplied by the reported field prices to derived the various local total expenditure "budgets." When indexed to the national average these "budgets" become the CLIs of this study.

With weights held constant these local "budgets" reflect only price differences and not changes in consumption patterns. The quality of the items purchased must also be held constant if the "budgets" are to report price differences only. Thus the CLIs of this study are fixed quantity and quality indexes.

Table C. Budget Weighting for Cost of Living Index Compilation, 1987.

Total Budget	$32,336	100.0%
Deferred Benefits	4,256	13.2%
Taxes	5,584	17.3%
Consumption & Housing	22,496	69.5%
Consumption & Home Ownership	$22,496	100.0%
Consumption	17,495	77.8%
Home Ownership	5,001	22.2
Consumption	$17,495	100.0%
Groceries	2,825	8.7%
Utilities	2,451	7.6%
Transportation	5,109	15.8%
Health	950	2.9%
Miscellaneous	6,160	19.0%

The representative budget is organized into four divisions: consumption, consisting of expenditures for food, utilities, transportation, health, clothing, entertainment, personal, etc; the mortgage, insurance, and property taxes required for home ownership; individual income taxes; and deferred benefit payments to pension funds and contributions. This organization allows special treatment of income taxes where the level of tax depends on income previously adjusted for cost of living, and also unpriced items included in the deferred benefit category. The pricing of both these categories will be discussed in the next chapter.

Fixed Market Basket

All goods and services in each location are of intended fixed quality and quantity, meaning the relative weights of the goods and services being priced are held constant for all locations. This fixed-weighting is called a Laspeyres-type index and is used in compiling the Cost of Living Indexes in this study for any given year.

Over time the composition of the goods and services purchased by families changes. Some goods may no longer be purchased. Items, previously not in existence, may be added. Some items may be substituted for others. Accordingly, the family expenditure pattern must be occassionally revised if cost differences are to accurately reflect what families currently purchase. At the major component level used in this study, reweighting may not be necessary for a period of years.

A fixed market basket imposes special field rules to achieve consistency in pricing. First, at each location the items themselves must be either exact duplicates or sufficiently similar to have no effect on price. National brand items easily meet this criteria. Where items differ slightly, consistency can be sought regarding all applicable features of value (functionality, durability, operating cost, size, strength, etc.). Written product and service specifications should be prepared to guide field pricing officers in selecting consistent quality. Judgment cannot always be avoided.

The theory and assumptions of cost index construction are more fully discussed in Chapter 2.

THE NATURE OF COST OF LIVING DIFFERENCES

Description of the Cost of Living Index requires elaboration if the real nature of the index is to be understood. In particular, the CLIs of this study need to be further described to account for the smaller range in values than readers might be conditioned to expect from more publicized real estate citings.

Realize initially, that much of our impression of the costs of living comes from what we know about housing costs. Real estate information is well publicized. When we read and hear of the astronomical cost of housing in Manhattan and San Francisco, and the comparatively low prices in Minneapolis and San Antonio, we tend to assume these large differences reflect all the other price differences in cost of living as well. This is not the case and will be our first topic.

This section examines a number of explanations of why the cost of living differences in this study exhibit a range less than that of popular opinion. At the same time, this discussion provides a firmer understanding of the what the index really reports.

Real Estate Prices Are Not the Same as Comparable Housing Costs

The housing prices attributable to cities commonly quoted by the National Association of Realtors and others, are not uniformly comparable. They generally reflect monthly sales of a quality homes in suburban areas to upper income families. Such higher priced homes differ greatly in their refinements and locational distinctions. Extravagant purchases of this nature exhibit a wide price range. Consequently quoted real estate prices usually exhibit a greater city-to-city range than does more modest and therefore more uniform housing. For comparable

pricing purpose, the housing market sought must reflect prices for typical community homes of less variant design and location, affordable by middle income families.

The prices used for this purpose are a combination of Housing and Urban Development (HUD) lot prices to represent home costs associated with location differences; and the Dodge Building Costs Indexes for new construction to represent the cost differences for a new house of fixed specifications. This latter component also establishes, to some degree, equivalent purchasing power for existing houses which compete in the same market as new houses and are therefore usually competitively priced. Use of these data for pricing are discussed in the next chapter.

Cost of Living Differences Tempered by Some Components

Of all purchases, the costs of home ownership contributes most to differences in cost of living. But home ownership constitute only about 16 percent of the budget of middle income families, and the price range for home ownership throughout the country is much greater than the range in prices for a majority of the other family purchased items. This means that the city-to-city range in total living costs is substantially less than the range in housing costs alone.

And there are other items in the budget which reduce geographical living cost differences. They include payments on pensions, personal life insurance, and medical care programs; contributions; and federal taxes; all of which are either not priced or whose "price" is essentially independent of location. Inclusion of these near geographically price neutral items in family cost of living substantially moderates the range of resulting total costs.

Non-Progressive Taxes Makes a Difference

Progressive income taxes contribute substantially to the cost of living. A cost of living index must include the added costs of paying higher taxes on income adjusted upward (by the index) in areas of high cost. Now that taxes are less progressive, cost of living allowances in high priced areas do not have to be jacked up as much to cover the higher tax requirements as in the past.[8] Consequently the range of cost of

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[8] The same city range of BLS Urban Family Budgets in 1981 was substantially greater than that of the CLIs of this study, due, in part, to the large upward adjustment required in 1981 to account for the more progressive tax rates at that time.

living is less now than in the past, other prices being equal.

Exact Geographical Location Important

The Cost of Living Indexes of this study include average retail prices representative of the entire metropolitan areas involved. New construction costs are reported partially, and land prices exclusively, for the surrounding residential communities. Thus the usually higher retail prices in the city core, although often the focus of living cost citations, are only a partial factor in establishing the CLIs reported here.

Consumers are well aware of the generally lower living costs in rural areas, fostering the belief that cities are comparatively expensive. Relative to adjacent rural areas this is true, but among cities, the prices are not "higher" but "typical" for urban consumers. Thus CLIs of 101 for Buffalo and Cleveland, and 98 for Dallas are common urban costs, reflecting prices numerically average but inherently higher than rural areas. The urban areas of Boston have costs 10 percent higher than for other cities, not in comparison to adjacent rural living. Users of the CLIs of this study must therefore appreciate the fact that index values of 20 to 30 percent above 100 are very high prices indeed since the 100 average for cities is well above most rural prices.

Inclusion of Residential Property Site Prices

The quality of residential property sites varies tremendously from one location to another, creating a problem with regard to the index compilation rule for fixed quality in the goods and services being priced. The ground itself, assuming it is permanently zoned residential without potential commercial use or subdivision, has no distinctive value to the homeowner. It is the location of the lot in terms of proximity to initial and future job opportunities, attractiveness of topography, schools, safety, climate, etc., that establishes relative value. Thus residential site price differences exclusively reflect the value home buyers and owners, usually with free choice, place on living in one location compared to another.

Since the consumer receives benefits consistent with the site price he is willing to pay, site price differences should be excluded from cost of living if the quality of this factor (site) is to be held constant. Stated differently, if the aim of the index is to price a fixed level of consumer satisfaction for those items whose quality cannot be held constant, then, site prices must be excluded since they directly reflect variation in satisfaction.

Traditional inclusion of site prices in cost of living indexes is based on the intent to limit reporting to measurable contract or transaction prices rather than attempt the difficult evaluation of consumer satisfaction. Also, the employment of many workers requires resident location other than what the individual might prefer. The site costs of such "forced" locations, it is argued, should be fully reimbursable as a required cost of living.[9] Consistent with this historical precedent, the cost of living indexes of this study include residential site costs. Thus the CLIs of this study report total living cost differentials without regard for variation in location specific amenities.[10]

The infinitely varying quality of residential sites creates a serious problem in defining the "fixed" characteristics involved for index pricing purposes. The traditional approach is to define the neighborhood as suitable for a given group of consumers. Certain quality suburban locations are deemed appropriate for "middle-executive" types for example. At best, this restraint only prevents pricing extreme site conditions; remaining price variations for "standard" sites, however rigorously defined, continue to fully reflect extensive location value preferences.

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[9] If employees are denied free choice and required to live in a given location, their satisfaction will likely not be proportional to the site price. They should be compensated according to the difference involved. Inclusion of total site price in a cost of living compilation assumes that a forced location has no differential affect on the consumer's satisfaction requiring adjustment, and the buyer should accordingly be fully compensated for site costs in the absence of allowing him to exercise a location preference. Actually, when a worker is forced to locate the household sustains some differences in satisfaction at each site, and the appropriate price adjustment to achieve a fixed utility level equal to others with free choice is somewhere between a cost of living unadjusted for site price and one fully adjusted.

[10] It should be noted that the inclusion of site costs in cost of living adjustments introduces incentive for workers to move to attractive areas knowing they will be fully reimbursed for the higher site costs involved. Areas with the highest reinbursable costs of living usually also have the best amenities which are then free of charge. This inequity can be reduced by adjusting wages for amenity value as well as cost of living. The resulting "equilibrium" wages are discussed in Chapter 9.

The solution to this site quality variation employed in this study is to price median lots from a large universe of purchases by middle-income families, the shear numbers involved assuring a lot price "representative" of a middle-income neighborhood in each location. This topic is discussed fully in the lot pricing section of Chapter 4.

Chapter 4. COST OF LIVING PRICING

Identifying suitable price series is always the most difficult and critical task in cost index construction; the principle problems being that of holding quality constant and locating suitable data sources. This chapter discusses the nature of the price series required and the rationale supporting the selections. The presentation follows the four major budget areas--deferred benefits, taxes, home ownership, and consumption. The methodology of employing the selected price series in index compilation are presented in the next chapter.

Deferred Benefits and Other Geographically Price Neutral Items

Five items in the budget (identified with an asterisk in Table B, Chapter 3)--payments for pension savings plans and life insurance, contributions, Federal individual income tax payments, auto financing, and other lodging outside of residence--are assigned no location specific prices, i.e., they are considered geographically price neutral (price = 100 at all locations). They constitute 14 percent of the budget and their inclusion in the Cost of Living Index tends to moderate price differences between locations.

The Cost of Living Index prices a fixed budget which allocates a given percentage for pension payments and contributions. As forms of investment, these payments have no immediate tangible returns and no contracted "price." Being defined as a fixed component of the budget, no alternative next best purchase may be substituted. This means the family experiences no geographically distinctive hardship "cost" associated with the foregoing of an alternative purchase. Consequently pension payments and contributions are designated geographically price neutral. The fact that the immediate location of a pension contribution affects its present purchasing power is of no consequence to the donor who intends only an investment for future use at a likely unknown retirement location.

Premiums on life insurance are generally set on mortality tables usually independent of the residence location of most buyers. Also, competition among nation-wide insurance firms tends to minimize geographical differentials. The price of life insurance is, in reality, essentially geographically neutral.

There is evidence that the variation in new car prices is sufficiently small that its exclusion from cost of living compilation would have negligible effect. American car manufacturers have established nearly uniform wholesale prices in North America by equalizing transportation costs, and, further,

they have encouraged informed price negotiation by attaching standardized sticker prices (recommended retail) to all new cars. Dealers, in turn, while negotiating individually with each customer, typically settle on mid-range markups. With mobile and informed buyers, dozens of car choices, and multiple dealers in every community, the resulting competitive market forces individual dealers to counterbalance greater overhead with more sales rather than higher prices.

The negligible effect on living costs of this price uniformity can be shown by this illustration. If the dealer's cost (invoice price) of a mid-size domestic family automobile is $12,000, the manufacturers recommended sale (sticker) price is commonly 10 to 14 percent[1] higher ($13,400). Actual sales prices to knowledgeable buyers are typically negotiated midway[6] between these two--dealer's and sticker--levels, i.e., $12,700; with a range also generally between the two, i.e., $12,700 +/- $700, or +/- 5.5%. Applying this range to an automobile's yearly finance costs of $2,787 (equal 8.6 percent of the $32,326 family budget being priced in Table B), results in a +/-.43% (maximum) effect on the CLIs of this study. This negligible effect leads to classifying automobile financing as a price neutral item.

Lodging away from home occurs during vacations and other family travel, with prices at many indeterminate locations. Consequently this item, in being non-location specific, is also geographically price neutral.

Taxes

Taxes, it may be argued, return proportional benefits to the resident and therefore should not be included in estimating cost of living as a fixed service purchase. However, the degree to which local and state government services are proportional to taxes paid varies greatly among jurisdictions. For example, in states with no individual income taxes, public services may largely be supported by non-resident payment of sales and severance taxes (an "exported" tax). Also citizens do not equally value or use the various public services. Inner city locations may have exceptionally high requirements for police, fire protection, welfare, etc., far disproportionate to the local tax base. Large jurisdictions may have advantages of scale which allows them to provide public services more efficiently. For these reasons the benefit/tax ratio for most taxes cannot be held constant, or, for that matter, systematically measured. The

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[1] Markup based on data from New Car Cost Guide, H. M. Gousha, Automobile Invoice Service, Simon & Schuster Inc., San Jose, California. Mid-range sales pricing based on field data collected by Runzheimer International, Rochester, Wisconsin.

consequence for index construction is that taxes are viewed here as a living expense without measurable direct returns, and hence a "cost of living" requiring reimbursement. And this view is consistent with the popular belief of many citizens that, as an involuntary payment, taxes are, ipso facto, a reimbursable cost rather than an elected benefit.

For purposes of identifying how tax rates are incorporated into the indexes of this study, federal, state, and local taxes paid by individuals may be organized as shown in Table D.

Table D. Federal, state, and local taxes paid by individuals, 1986.

(millions of $)	State	Local	Federal
General Sales	$74,817*	$15,889	---
Selective Sales	37,556	6,739	---
License	14,908		---
Individual Income Tax	67,405*	6,948	$348,959*
Residential Property++	2,613*	64,414*	---
Estate & Gift	2,533		---
		TOTAL	$642,781

* Taxes accounted for by Cost of Living Indexes equal $558,208 million.
++ Residential property estimated as 60 percent of total property taxes collected based on relative assessed value.

Sources: Measuring State Fiscal Capacity: Alternative Methods and Their Uses, Advisory Commission on Intergovernmental Relations, Washington, D.C., September 1986, and Government Finances in 1984-86, Bureau of the Census, U.S. Department of Commerce, Washington, D.C., Nov 1986, page 2.

The asterisk taxes above, state government general sales, federal and state individual income, and state and local residential property are specifically compiled in the cost of living estimates of this study. Motor fuel and telephone taxes are included in other prices. Together these included taxes account for approximately 71 percent of the total state and local taxes paid by families. No adjustment is made for taxes on other selective sales items, licenses, and estate and gift taxes since effective rates for these types of taxes cannot be determined.

State General Sales Tax Sales or gross receipts taxes are generally applicable to all types of goods and services with the usual exception of grocery items. General sales tax rates are

reported by the Advisory Commission on Intergovernmental Relations (ACIR).[2] Individual state rates are applied to the ACCRA city prices for each item in the "other" consumption category of the budget (see Table B, Chapter 3). Local sales taxes have not been incorporated in this study due to the complexity and extent of the compilation. This means that for cities with high local sales taxes, the reported Cost of Living Indexes are slightly understated.

Federal and State Individual Income Federal income taxes are uniformly applied to residents of all states. Consequently no individual state adjustments are required. However, if earnings are adjusted by an employer for cost of living, workers must pay taxes on the resulting higher or lower income level. This means that the cost of living index itself must include amounts to pay this greater or lessor tax. Details of how this is accomplished are explained in Step 5 in Chapter 5.

The various effective rates for state individual income taxes are reported by the District of Columbia Government for a family of three. These rates are applied to the $35,000 family income to derive the special "price" or tax payment requirement for each state. As with federal income taxes, the cost of living indexes themselves must be adjusted upward to reimburse the family for additional state income taxes requirements for income increased in areas of high living costs. The treatment of taxes in index compilation, again, is reported in Chapter 5.

State & Local Residential Property Taxes Federal Housing Authority (FHA) effective tax rates for each city in the core data set are included in the cost compilations for housing. The mechanics of property tax inclusion in housing costs are presented in Step 2 in Chapter 5.

Consumption

Selected components of the American Chamber of Commerce Researchers Association (ACCRA) data have been used to construct the consumption component of the cost of living indexes of this study. These data are described here.

The ACCRA quarterly reports inter-city cost of living differences for 224 cities (see Table E, Source for citation). The 59 items forming the basis of the all-item index have been carefully chosen to reflect the different categories of consumer expenditures. Weights assigned to relative costs are based on

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[2] Advisory Commission on Intergovernmental Relations, State Fiscal Capacity and Effort, 1986, ACIR, Washington, D.C., 1989, 122 pages.

the latest government survey data on a mid-management executive family's pattern of expenditures. All items are priced at the local level by Chamber of Commerce research personnel at a deliberate time and by standard specifications. A careful three stage review is made to eliminate errors or non-compliance with specifications.

A summary of the items priced by ACCRA is shown in Table E. Price data used in compiling the Cost of Living Indexes of this study are identified by an asterisk.

Table E. 59 Items Price by the American Chamber of Commerce Researchers Association (ACCRA) Inter-City Cost of Living Index.

Grocery Items (27 items)*
- 5 meats, fish, fowl
- 4 dairy products
- 3 produce
- 1 bakery
- 1 tobacco
- 13 miscellaneous (coffee, sugar, shortening, soft drink, peas, flakes, etc.)

Housing (2 items)
- Apartment monthly rent
- Home purchase price and mortgage payment

Utilities (3 items)*
- Electric power, monthly cost#
- Natural gas, oil, monthly cost#
- Telephone (includes tax)

Transportation (3 items)*
- Bus fare
- Auto maintenance
- Gasoline (including tax)

Health Care (4 items)*
- Hospital room
- Office visit, doctor
- Office visit, dentist
- Aspirin

Misc. Goods & Services (20 items)*
- Hamburger, pizza, fried chicken, haircut, tooth-paste, dry cleaning, under-wear, dress shirt, jeans, appliance repair, movie, newspaper, bowling, liquor, beer, wine, etc.

Source: Inter-City Cost of Living Index, American Chamber of Commerce Research Association, Houston, Texas.

Prices for the above items are reported on a unit of consumption basis, e.g., price per package, pound, monthly use, ride, daily delivery, etc. An important exception are utility costs (#) which also include a load factor, i.e., the amount of power or fuel required to heat and cool a typical house at the given location. Utility "prices" are thus reported as monthly costs based on both local unit prices and consumption as determined by climatic conditions. This inclusion of load is

consistent with the purpose of cost of living measurement to report costs typically required for ordinary living.

The ACCRA data is based on very limited city sampling. However, instructions to the field sources regarding sampling time, location, and type of retailers promote equivalent pricing conditions. Further, the items priced are often national brands which provides the desired constant quality. Overall, the ACCRA price data for grocery items, utilities, transportation, health, and miscellaneous (all identified by an asterisk above) are acceptably accurate for purposes of the estimates of this study, and are used to compute the costs of consumption. The following discussions of housing prices will explain why an alternative has been selected in this area.

Residential Property

Residential property represents the most serious pricing problem in cost of living measurement. The difficulty lies in identifying in each jurisdiction similar existing[3] houses and local living conditions representative of purchases by a given class of consumer. If sampling is performed by field agents, selection is necessarily a matter of judgment and the myriad of varying conditions involved makes decisions somewhat arbitrary, even with detailed limiting criteria. Achieving truly representative and comparable prices by selective sampling is suspect under these circumstances. Understanding the deficiencies involved leads to development of an alternative strategy.

Deficiencies in Selective Sampling The typical approach used for pricing residential property for cost of living purposes is that of defining a "standard" house and location suitable for a given consumer group, followed by field pricing of a sample of houses selected on the basis of these criteria.

To secure comparability, field agents are provided a set of design and material specifications for a "standard house" which the consumer group would be expected to normally require. However, these criteria cannot be too specific because of the tremendous range in house and lot features across the country due to varying historical and architectural preferences, average lot size, local building codes, climatic requirements,

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[3] The proportion of long-term mortgage loans for new 1-4 unit family homes in 1985 was 78% existing units, 22% new units, U.S. Dept. of Housing and Urban Development, monthly and quarterly press releases based on the Survey of Mortgage Lending Activity.

availability of material, and dates of construction.[4] Generally selections are ultimately based on the field agents best estimate of a house suitable and typically purchased by a given consumer group.

Even more difficult is the task of selecting a residential neighborhood acceptable to the consumer group. We are speaking here of the "quality of life" or location-specific amenities which establish the value of the residential site. These amenities include the characteristics of fellow residents, view, yard size, commuting distances, proximity to culture and recreational pursuits, quality of local schools, absence of crime, etc. Here again the great diversity of American communities makes selection of "representative" sites a near arbitrary choice among many alternative packages. Even sites exactly or nearly the same in immediate local conditions, if sufficiently separated differ in climate, proximity to major cities and recreational areas, and job opportunities.

For relatively homogenous goods and services limited price sampling does not involve too great a risk because competition establishes fairly uniform prices within sizeable markets, as large as the metropolitan reporting area required. However, residential properties are individually distinctive. Pricing a small sample, no matter how carefully selected, still may report atypical features affecting price that are not representative of median conditions in the jurisdiction as a whole.

The differing judgment of the field representatives and the multiplicity of qualifying house-amenity combinations faced in any jurisdiction, simply allows too great a latitude in choice to ensure accurate reflection of a representative or average property. No matter how exact and restrictive the

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[4] The difficulty of pricing "equivalent" typical housing is apparent from the following structural variations from FHA data:

Median lot size--Atlanta, 21,666 versus New York City, 2,700 ft^2.
Site to property value--Los Angeles, 37% vs Lubbock Texas, 11%.
Median improved area--Galveston, 1,612 vs Hartford 975 ft^2.
Median age--Allentown, Pa, 54 vs Corpus Christi, Texas, 7 yrs.
Ave number of rooms--Reading Pa, 6.2 vs Madison, Wis, 5.1.
Auto area--Souix Falls, SD, 94% garage vs Tucson, 60% carport.
Basement--Pittsburgh, 93% full vs Sarasota, 98 % slab.
Building material--Philadelphia, 43% brick vs Bellingham, Wash, 78% wood siding.
Central AC--Austin, Texas, 93% vs Great Falls, Mont, 2%.

specifications of house, site, and consumer group,[5] and how carefully these criteria are observed, there remains literally thousands of combinations in any jurisdiction that would appear to equally quality. A small sample is statistically unable to ensure accurate representation of the entire residential area in question.[6]

These shortcomings of the selected sample suggest the need for an alternative approach. The alternative adopted in this study is to first separately price site locations using Department of Housing and Urban Development, Federal Housing Administration (FHA) lot prices representative of middle-income family purchases. Second, rather than risk loss of equivalency by pricing existing houses, substitute new construction costs. This substitution holds house quality constant by proving consumers equivalent new house purchasing power at each location. Discussion of this approach follows.

Representative Site and Equivalent New House Purchasing Power The varied nature of residential property requires special rules to obtain comparable pricing for cost of living purposes. The possibility of multiple "qualified" selections rules out procedures requiring personal judgment. Practical field pricing to obtain valid comparisons of residential property costs requires imposition of two restraints: (1) site location data must be extensive and representative of all neighborhoods within the jurisdiction occupied primarily by a given category of consumers; and (2) the house structures, or a reasonable

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[5] If a middle-income family is not chosen as the consumer, the resulting cost data are applicable only to a specialized and relatively small segment of the American populace. Geographical difference for homes typically purchased by upper-income families may differ from the pattern of middle-income homes. For example, it is possible that the relative price of expensive homes in large versus small cities is greater than that of modestly price homes. Cost of living differences based on high priced houses would then be greater than the cost differences middle-income families would likely experience.

[6] The variability of house prices in the same county, many of which might likely meet a given set of selection criteria, can be illustrated by this example. In 30 neighborhoods in Montgomery County, Maryland in 1986, single family house prices ranged from $84,000 to $240,000. Based on nearly 19,000 sales, the average sale price of 1,689 houses sold in the Germantown neighborhood was $91,476. At the other extreme, 875 homes in the Potomac neighborhood sold for an average price of $223,180, a 2.4 to 1 ratio. Source: Rufus S. Lusk & Son, Inc.

substitute, must be of near fixed design and specifications, except for requirements imposed by climate and local ordinances beyond the control of the consumer. These distinctive restraints suggests the need for separate treatment of site costs and improved area (structure) costs.

Observing these restraints, housing property costs are defined here, for purposes of establishing geographical cost of living differentials, as: annual mortgage principle and interest payments and real estate taxes paid on residential property typically occupied by middle income families within the jurisdiction; such property consisting of a representative site, and improvements equal to the cost of new construction for a standard one-family house of fixed size.

The site price and real estate tax rates employed are reported by the Federal Housing Administration (FHA) of the Department of Housing and Urban Development[7]; new construction costs are based on Dodge Building Costs Indexes reported by McGraw-Hill Cost Information Systems (see f.n. 10). The data are presented in Table 4.

Pricing the Site Location As described, location amenities and corresponding value vary greatly from one residential site to another within the same city or county. Substantial block-to-block differences are not unusual. Reliance on a few selected pricings as "representative" risks great error. Site prices representative of middle-income neighborhoods for an entire jurisdiction can be approximated only by a statistically adequate sample size. While the FHA site prices used in this study, do not represent a statistically structured sample, the data, when viewed over a number of years, involves sufficient observations for purposes of estimates.

The Department of Housing and Urban Development reports FHA site prices for Metropolitan Statistical Areas (MSAs) based on purchases or refinances by the occupant of one-family existing homes. The number of transactions involved, averaging 120 per city,[8] and $90,000 mortgage amount limitation,[9] suggest that

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[7] The U.S. Department of Housing and Urban Development yearly publishes extensive housing data derived from the Federal Housing Administration operations under Section 203. See FHA Homes 1987, Data for States and Selected Areas on Characteristics of FHA Operations under Section 203, U.S. Department of Housing and Urban Development, Washington, D.C.

[8] HUD reports only about 10 percent of the 400,000 or more single family cases contracted each year. The average number of cases per city for the 344 cities reported in 1980 was 120, ranging from a low of 1 to a high of 2,023. The small

resulting median lot prices over a three year period should be reasonably respresentative for a cross-section of homes in middle-income residential areas at each location.

It is important to note that the site prices used are prices for the total area rather than unit (per square foot) prices or unit prices applied to a standard lot size. Residential lot sizes are due to a number of factors other than land value such as historical architectural styles (and corresponding lot requirements), residential street patterns, historical and current zoning ordinances, and city boundaries and commercial and terrain barriers that may restrict expansion. The value consumers place on location is thus the total price they must pay for whatever lot size is available, with larger lots thrown in as an added local amenity. As long as zoning regulations permanently restricts commercial exploitation, i.e., division in to subplots for resale, the value of this additional size amenity for residential purposes (e.g., lawn, garden, swimming pool, woods, parking, etc.) is always very small compared to a lot's total price.

Thus the price of locating in an attractive city is the current market price of lots made affordable by their historical small size, not the astronomical unit costs resulting from a small denominator. Similarly the exceptionally low unit costs of large residential lots in outlying suburban areas reflect the availability of cheap land at the time of parcelling, not the price consumers currently attach to the location.

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number of cases reported for some cities in a given year is obviously not representative. A three year time adjusted average of FHA data was used when possible to minimize the effects of individual year variability. As additional year data is introduced into this model, errors due to a small number of FHA cases will be reduced.

See U.S. Department of Housing and Urban Development, FHA Homes, 1985, Data for States and Selected Areas on Characteristics of FHA Operations under Section 203, Washington, D.C. 20410.

[9] The maximum FHA mortgage amount that may be insured is $90,000 ($101,250 in Alaska and Hawaii).

The average house sale price for FHA loans in the summer of 1987 equaled $70,600 (as reported by the National Association of Realtors); for conventional fixed rate 15 year mortgages, $110,000; and for 30 year mortgages, $138,800. The average family income for a home buyer taking an FHA loan in 1986 was $38,000. (An estimated 60 percent of all families in the United States had income less than this amount.)

It follows that applying aberrant unit costs to a standard lot size, however attractive in terms of holding size constant, also does not reflect consumer's assessment of location value. Furthermore, cost of living reimbursement based on a fixed lot size would underpay consumers living in areas where typical lots were larger and over compensate consumers in areas with smaller lot sizes. Thus to compensate a New York City resident for a typical lot size of say 7,700 square feet when the typical city lot is only 2,900 foot square would unduly enrich the inhabitant.

The procedures used by FHA field agents to price land deserve explanation. Ratios of site to total property values vary greatly from as high as 37 percent for attractive metropolitan areas such as Los Angeles, to as low as 11 percent for cities such as Lubbock, Texas where residential expansion is virtually unlimited. This range means that site values, while related to overall property value, must be distinctively assessed. FHA field appraisers estimate site values based on their knowledge of nearby or equivalent vacant lot prices, and knowledge of local historical ratios and trends in lot to total property prices. Also, the value of a lot may be estimated by subtracting a depreciated value of a newly constructed replacement house from the property's current sale price.

Pricing the House Structure to Achieve Consistent Quality

As previously stated, the variant multiple design and structural features of houses makes it extremely difficult to hold house quality constant. What is required is essentially pricing the exact same house in each location with some adjustment for special climatic and safety requirements. If a new house is substituted for existing houses, this consistency can be achieved by use of building construction indexes which price a fixed market basket of construction labor and materials.[10] This

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[10] The Dodge Building Cost Indexes are published semi-annually (September and March) for approximately 600 cities. The index reports wage scales prevailing locally for 20 building tradesman and prices paid by builders for 10 basic materials available from local retail suppliers. These data are weighted to reflect the impact of the basic item components on the overall cost of a "typical" composite residential/non-residential building.

Trades represented include brick layer, carpenter, sheet metal worker, electrician, plumber, glazer, lather, plaster, painter, roofer, teamster, laborer, etc. Material items are ready mix concrete, reinforcement rods, concrete block, structural steel, plywood, lumber, gypsum board, asbestos shingles, electrical conduit, copper pipe, etc. Definitions for occupations and materials are specified. Reporting sources include general and specialty contractors in each city, building

approach reimburses consumers for relative housing cost differences by establishing equivalent new house purchasing power as opposed to the more traditional but error prone method of using exiting house sale prices.

Geographical differences between new house construction costs and existing house sales prices may be small. Since most housing markets include both new and existing houses, they are usually competitively priced, i.e., the price of most homes is proportional to comparative value. Local housing realtors provide excellent market information with potential buyers exercising exceptional care in making life's major purchase. Most buyers are knowledgeable of the alternatives including the value in purchasing a new versus old house. Informed consumers coupled with the large number of property sellers results in near perfect market action and extremely competitive house prices.

Short run housing shortages may allow local builders to "mark up" new house prices more than the tradition 15-20 percent. Conversely, an even more rare housing surplus may temporarily require builders to lower their mark ups and reduce their volume. These local variations in "profitability" may be reflected in the labor costs of the Dodge Construction Indexes. However, a more conservative rule is that short term variations in new house sale prices from actual construction costs are <u>not</u> reported in the housing costs of this study.

It should be noted in closing that providing consumers with equivalent new house purchasing power does not take into account special climatic needs for insulation, shutters, local construction safety regulations, and other building requirements beyond the consumer's control. In many ways the consumer perceives benefits from such requirements directly proportional to their cost and reimbursement is not required. In other instances the requirements may be counterbalancing such as added heating costs accompanied by lower cooling requirements. In any event these costs are likely to be small relatively to total property value.

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product distributors, construction labor consultants, and Chambers of Commerce.

See <u>Dodge Unit Cost Data for U.S. and Canadian Cities</u>, Volume 2, P. E. Pereira, Chief Editor, McGraw-Hill Cost Information Systems, P.O. Box 28, Princeton, New Jersey 08543.

Chapter 5. COST OF LIVING INDEX COMPILATION

In the previous chapter the conceptual and practical problems in selecting suitable price series for measuring cost of living were discussed. This is the heart of any cost index undertaking, at once both the central and most difficult task. Now, with the various price series in place, the procedures of index compilation may be described. The methodology is far simpler and more mechanical than pricing. The main problem in compilation is selecting the appropriate statistical tools for index construction and prediction.

The discussion begins with the objectives sought in developing a model, followed by a review of the budget and data organization which assists in keeping track of the various components. The mechanics of index compilation and prediction are then described in five steps. Statistical details of the regression analysis to derive the prediction equations are presented in Appendix A.

Model Objectives

The Cost of Living Indexes (CLI) of this study are based on a model intended to:

(1) measure urban family cost of living for middle-income home owners, with sufficient validity to serve as a reasonable geographical adjustment factor to establish equal real wages.

(2) use secondary data sources exclusively to avoid prohibitively costly data collection.

(3) provide the necessary regression analyses to predict cost of living for a larger universe of cities and urban areas sufficient to aggregate as reasonable state averages.

(4) allow yearly updating.

(5) allow periodic reweighting of budget items in response to changing consumer buying patterns.

Budget and Data Organization

Recall again that the budget to be priced is organized into four divisions (Table B, Chapter 3). Knowledge of these divisions will aid in understanding the various model components designed for index compilation.

(1) Deferred benefits, consisting of investment type payments without immediate benefits such as inputs into pension plans and contributions. These items are generally not priced, i.e., they are geographically price neutral.

(2) Individual Income Taxes where the amount of the tax depends on family income level after adjustment for cost of living.

(3) Home ownership which consists of home finances such as mortgage interest and principle payments, property taxes, and required insurance payments.

(4) Consumption, consisting of family expenditures for food, utilities, transportation, health, apparel, entertainment, etc., where the family members immediately utilize or directly benefit from the expenditure.

These four expenditure components are organized for cost of living budget weighting purposes as previously indicated in Table C, Chapter 3, reproduced here.

Table C. Budget Weighting for Cost of Living Index Compilation, 1987.

Total Budget	$32,336	100.0%
Deferred Benefits	4,256	13.2%
Taxes	5,584	17.3%
Consumption & Housing	22,496	69.5%
Consumption & Home Ownerhsip C&H	$22,496	100.0%
Consumption	17,495	77.8%
Home Ownership	5,001	22.2
Consumption	$17,495	100.0%
Groceries	2,825	8.7%
Utilities	2,451	7.6%
Transportation	5,109	15.8%
Health	950	2.9%
Miscellaneous	6,160	19.0%

An additional structure helpful in understanding CLI compilation is the manner in which the data are organized for regression prediction. This organization is presented in Table F of this chapter, and will be explain as part of the STEP 4. Important at this point is recognition that the data grouping titled City Grouping #1, the Core Universe, consists of approximately 150 cities for which all price data are available, i.e., Dodge construction costs, HUD site prices, and ACCRA consumption costs. Consumption and Home Ownership (C&H) Costs are combined for this city grouping in STEP 3. C&H values for city groups #2, #3, and #4, for which complete price data are not available, are then predicted from regression derived equations.

Approach and Compilation Procedure

Compilation of the Cost of Living Indexes of this study is accomplished in three major divisions: (1) Separate compilation of Consumption and Home Ownership costs, and, for the core universe (City Group #1) combining the two into a weighted C&H total, (2) Regression analyses of this core universe to derive C&H prediction equations for cities for which all data are not available (City Groups #2, #3, and #4), and (3) Addition of taxes and price neutral items to compiled Consumption and Home Ownership costs for all cities to derive Cost of Living Indexes.

The dominant role of housing in establishing consumption and home ownership costs was early recognized. The accuracy of the regression estimates depend on the high predictive capacity of home financing costs which "explain" a large portion of the geographic C&H cost differences.

Keeping in mind both the budget and data organizations described above, the general nature and sequence of the five steps taken in constructing the Cost of Living Indexes in this study are outlined in the next two sections.

Compilation of Consumption and Home Ownership Costs

STEP 1. Compile indexes of Consumption using the ACCRA price data for approximately 210 locations (City Groupings #1 and #2). This involves a simple summation of the weighted price indexes for each of the five components based on their respective budget proportions (from Table C) as follows:

Item	Budget Weight
Groceries	8.7%
Utilities	7.6%
Transportation	15.8%
Health Care	2.9%
Miscellaneous Goods and Services	19.0%
CONSUMPTION	100.0%

The price indexes reported by ACCRA are based on a simple all-city average equal to 100. The derived Consumption Index is population weighted so that 100 equals national average resident

costs.[1]

The consumption data for fall 1986, fall 1987, and a two year average are reported in Table 3. Note that house furnishings and operations as a $1,603 budget item is excluded from the consumption cost compilation because no price series for these items is available. This exclusion has a minimal effect if the price differentials involved are similar to those of the other included categories.

STEP 2. Compile indexes of Home Ownership Costs for approximately 240 locations (City Groupings #1 and #3) using HUD site and Dodge Construction Costs. The HUD data employed are site median sales prices for one-family existing homes, and average effective real estate tax rates (derived).

Geographical price differences for a new house of fixed design and specifications are established equal to local unit construction costs times a standard 1,500 square foot improved area (plus a fixed builder's markup). The Dodge Construction Index, pricing ten widely used materials and twenty basic building trade labor rates, is employed to measure geographical construction cost differences.

Home mortgage interest and principle rates are set at 8 percent applied to a mortgage equal to an estimated 95 percent of property value. Residential property taxes are estimated from HUD FHA effective property tax rates (taxes paid/property value) for 1987 and time adjusted previous years, multiplied by property values equal to site plus house value as determined above.

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[1] A simple example will illustrate the additional information that population weighted cost indexes provide.

City	Population	Living Cost	Numerical Ave Index	Population Weighted Index
A	5,000	$19,600	80	56
B	8,000	17,150	70	49
C	30,000	25,550	105	73
D	1,000,000	35,350	145	101
U.S. city mean		$24,413	100	Pop wtd U.S. mean of 100 = $34,853

The numerical average indexes report living costs relative to a city mean of $24,413. More significant and useful is the $34,853 mean cost of living per resident. The population weighted indexes report city living costs relative to this resident mean.

The data and computations are illustrated by the national or all-city population weighted average shown below:

FHA mean SITE PRICE			$16,016
Dodge unit construction cost	$41.53/sq ft		
x FHA mean house size	x 1,500 sq ft		
= Construction Cost	$62,295		
x 20% builder markup	x 1.20		
= STRUCTURE SALE PRICE			$74,754
PROPERTY SALE VALUE			$90,767*
Loan on property equal to 95% of property value	$86,229		
x 8% mort int & principle	x .08		
= YRLY MORTGAGE PAYMENTS		$6,898	
Property value	$90,767		
x FHA effective property tax rate	x .0131		
= PROPERTY TAXES		$1,189	
Total annual property costs		$8,087	= 100.0 U.S.ave

*population weighted U.S. average

STEP 3. Establish combined Consumption & Home Ownership (C&H) costs for the core universe (City Group #1) for approximately 150 cities for which both consumption and home ownership costs are available. C&H costs are a simple budgeted weighted average (.222 x Home Ownership + .778 x Consumption; from Table C. With all data available the accuracy level is identified as level 1.

The regressions and resulting prediction equations derived in subsequent steps are developed from the C&H cost and price data of this core universe.

Prediction of Combined Consumption & Home Ownership Costs

STEP 4. Regression of C&H costs for the core universe establishes the predictive equation for C&H costs for city groups #2, #3, and #4, using Home Ownership, Consumption, and Dodge construction costs as independent variables as available. Table F shows the organization of the data and the resulting regression equations of estimated relationships. The regression analysis is presented in Appendix A.

Table F. Cost of Living Data Organization and Regression Summary

AVAILABILITY AND ORGANIZATION OF DATA

City Grouping	Number of Cities	Data Set (by source) Availability			
		Home Ownership Dodge	+	HUD	Consumption ACCRA
#3	90	YES	+	YES	
#1 Core universe	150	YES	+	YES	YES
#2	60	YES			YES
#4	280	YES			

REGRESSION ANALYSES OF THE CORE UNIVERSE

Estimation Equations		R^2	Standard Deviation	Accuracy Level
Core Universe	Empirical measurement	-----	0.0	1
Cty Gp #2	C&H = .345 x Dodge + .234 x Consumption + .465	.8725	2.7	2
Cty Gp #3	C&H = .396 x Home ownership +61.3	.8234	3.9	3
Cty Gp #4	C&H = .603 x Dodge + 40.5	.7684	5.4	4

In STEP 1, ACCRA prices are used to establish the costs of Consumption. STEP 2 used Dodge construction costs and HUD site prices to establish Home Ownership costs. Data from all three sources is available and used to compile Consumption & Home ownership (C&H) costs for a core universe of approximately 150 locations, in STEP 3. From core data base, STEP 4 employs regression analysis to predict C&H costs for the other city groups (#2, #3, and #4) for which less than complete data are available.

C&H cost estimates for approximately 60 locations in city group #2 are based on a regression using Dodge construction costs and ACCRA prices as two independent variables. C&H cost

estimates for 90 locations in city group #3 are based on regression using only Home Ownership costs alone as a single independent variable. Finally, C&H costs estimates for approximately 280 locations in city group #4 are based on a regression using only Dodge construction costs as a single independent variable. The resulting prediction equations are presented below Table F. The regression statistics are presented in Appendix A.

R-square values indicate the "goodness of fit" of the straight line prediction equation to the actual observed values. This "fit" is the degree to which the prediction equation "explains" varinace in the dependent variable (C&H costs), or, more simply, the accuracy of the prediction. High R-square values mean that differences between predicted and actual values will be small. This difference is measured by the standard deviation.

A standard deviation of 2.7 index points, for locations in city group #2, as an example, means that the predicted C&H costs for 68 percent of the cities within the group are expected to be within + or - 2.7 index points of the actual costs if the actual costs are normally distributed. An additional 27 percent of the cities in the group will likely have predicted costs between + 2.7 and + 5.4 index points above actual values, or -2.7 to -5.4 index points below actual values. An additional five percent of the city predicted costs are expected to vary from actual values by + or - 5.4 index points. The assigned accuracy levels--2, 3, and 4, reflect larger standard deviations and hence an increasing range of expected deviation of predicted values from actual values.

Inclusion of Individual Income Taxes and Deferred Benefits

STEP 5. Compute Cost of Living Indexes (CLI) for all locations by combining Consumption and Housing Costs (C&H) with federal and state income tax payments and expenditures for deferred benefits. This step cannot be accomplished by a simple weighted average summation as previously performed, due to the inter-dependency of the CLI and individual income taxes.

Individual Income Taxes Families whose real income is established by the cost of living in their area have to pay personal and other taxes at a rate based on their nominal income level, i.e., income adjusted for cost of living. Thus families pay proportionally more taxes relative to their real income in high cost areas, less taxes relative to real income in low cost areas. The cost of living measurement, must, in turn be adjusted to account for these tax payment differences if after tax real wages are to be equal.

In the past, federal and consequently some related state individual income taxes were highly progressive, requiring a substantial upward adjustment in the cost of living indexes in high cost areas to account for the additional tax burden imposed on their higher adjusted incomes.[2]

In 1987, federal income taxes uniformly taxed "middle-incomes" at basically a single rate. State income taxes remained somewhat progressive. Since individual income taxes are no longer as progressive for the range of incomes normally considered "middle," the required adjustment to cost of living is more uniform and less substantial than would have been required previously. In fact, in some high cost areas, federal and state income taxes are now "priced" lower than other purchases and their inclusion results in a cost of living index less than that for consumption alone. Similarly, in low cost areas, a fixed tax rate may result in a higher "priced" "tax expenditure" than other purchased items, raising cost of living above cost of consumption.

Price Neutral Items Items whose price is independent of geography are purchases which are either not currently priced, such as payments into a retirement fund, or are priced at locations other than the family's residence, such as out-of-town hotel and food purchases. In constructing the Cost of Living Index, these price independent components which amount to 13.6 percent of the family budget are priced at a neutral 100 value.

Formula for Inclusion of Tax and Price Neutral Items To include federal and state[3] personal income taxes and price independent expenditures in cost of living, and to adjust city CLI values to account for differences in the amount of income taxes paid in high and low cost areas, the following formula (see derivation following this section) is employed:

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[2] BLS made this adjustment in their reported budgets through a complicated adjustment procedure involving computations of state tax amounts on various income levels. The highly progressive income taxes at that time (1973-84) substantially contributed to the range of index values obtained.

[3] Local government individual income tax payments are generally small, equal to only one-tenth the level of state income taxes (see text Table D, Chapter 4, page 3). Yet, for an individual city they can be a factor in cost of living. The resources available for this study did not permit the extensive search required to identify individual city tax rates.

$$CLI = \frac{(C\&H\ Budget\ \%\ x\ C\&H\ Index) + (Price\ Neutral\ Budget\ \%\ x\ 100)}{(1 - Federal\ and\ state\ tax\ rate)}$$

where

CLI = City cost of living index.
C&H Budget % = National average percent of total family expenditures used for consumption and home ownership. (69.3% from Table C).
C&H Index = City index of Consumption & Home Ownership relative costs.
Price Neutral Budget % = National average percent of total family budget expended for price neutral items (13.6% from Table C).
Federal tax rate for a 3 member family income of $36,000 is 14.2% based on a 1987 tax liability of $4,900 on income of $34,441 for a married couple with one dependent reported by the U.S. Department of the Treasury.
State rate, see text Table G.

$$CLI = \frac{(.693\ x\ C\&H\ Index) + 13.6}{1 - (.142 + state\ tax\ rate)}$$

The C&H Index values used in this formula are reported in Table 3. The resulting city CLS are reported in Table 1 and 2.

Derivation of Formula for Inclusion of Taxes in CLI Compilation

As previously discussed, the adjustment of wages and salaries for cost of living affects personal income taxes calculated on the cost of living adjusted income. The change in taxes, in turn, alters cost of living. A special formula is required if this inter-dependency is to be properly accounted for in index compilation. The derivation of this formula, which also accounts for price indpendent items in the family budget is as follows:

Terms reported as national averages are underlined. All other terms report city values.

CLI = city Cost of Living Index.
C&HI = city index of Consumption & Home Ownership costs.
Income = national average family income.
Taxes = city Federal and State personal income taxes paid.
Rate = city Federal and State personal income tax rate.
Exp = city average total family expenditures.
Exp = national average total family expenditures.
C&H Exp = national average family expenditures for consumption.
Independent = national average family expenditures for items whose price is non-location specific.

The derivation begins knowing that city taxes equal national average family income adjusted for city cost of living multipled by the federal and state personal income tax rate.

(1) Taxes = Income x CLI x Rate

From Table B, Chapter 3, it can be seen that with little savings, family income and expenditures are essentially the same, therefore substituting Exp for Income in equation (1):

(2) Taxes = Exp x CLI x Rate

also we know that city family total expenditures equal city family expenditures for consumption and housing multiplied by the city cost index for these items, plus expenditures for price independent items, plus city taxes.

(3) Exp = (C&H Exp x C&HI) + (Independent x 100) + Taxes

and city family total expenditures equals national average family total expenditures multiplied by the city cost of living index.

(4) Exp x CLI = Exp

Substituting equations (2) and (3) in the right side of (4):

$$\text{Exp} \times \text{CLI} = (\text{C\&H Exp} \times \text{C\&HI}) + (\text{Independent} \times 100) + (\text{Exp} \times \text{CLI} \times \text{Rate})$$

factoring and rearranging

$$\text{CLI} \times \text{Exp} \times (1 - \text{Rate}) = (\text{C\&H Exp} \times \text{C\&HI}) + (\text{Independent} \times 100)$$

(5) $$\text{CLI} = (\text{C\&H Exp}/\text{Exp} \times \text{C\&HI} + \text{Independent}/\text{Exp} \times 100)/(1 - \text{Rate})$$

from Table B, the ratio of U.S. national average Consumption and Home Ownership expenditures to the total budget is .693; for independent item expenditures the budget proportion is .136. Substituting in equation (5):

$$\text{CLI} = \frac{(.693 \times \text{C\&HI}) + 13.6}{(1 - \text{Federal} - \text{State Tax rate})}$$

where the Federal tax rate is .142

Table G. State Individual Income Tax Rates, Three Person Family, $35,000 Income Level, 1987.

GRADUATED STATE TAX

Alabama	2.5%	Minnesota	4.0%
Arkansas	2.2%	MIssouri*	2.1%
Arizona	2.2%	Mississippi	2.0%
California	1.4%	Montana	3.1%
Colorado	3.0%	New York*	3.6%
Delaware*	2.9%	New Jersey	1.7%
Dist of Columbia	4.9%	New Mexico	2.1%
Georgia	2.9%	North Carolina	3.4%
Hawaii	4.7%	Ohio*	2.2%
Iowa	2.9%	Oklahoma	2.2%
Idaho	3.8%	Oregon	3.7%
Kansas	2.1%	South Carolina	3/3%
Kentucky*	3.0%	Utah	4.5%
Louisiana	1.5%	Virginia	3.0%
Maine	2.6%	Wisconsin	3.8%
Maryland*	1.4%	West Virginia	2.8%

STATE TAX RATE AS A PERCENT OF FEDERAL LIABILITY

North Dakota	1.3%	Rhode Island	1.9%
Nebraska	1.7%	Vermont	2.2%

FLAT STATE TAX RATE

Connecticut	0.0%	Michigan*	2.5%
Illinois	2.1%	New Hampshire	0.0%
Indiana	3.2%	Pennsylvania*	2.1%
Massachusett	3.8%		

NO STATE INCOME TAX

Alaska	Texas
Florida	Washington
Nevada	Wyoming
South Dakota	
Tennessee	

* Local income tax rate excluded.

Source: Special tabulation from Tax Rates and Tax Burdens in the District of Columbia: A Nationwide Comparison, Government of the District of Columbia, Washington, D.C., June 1988.

PART II. AMENITIES

CHAPTER 6 AMENITY CONCEPTS AND THEORY

An amenity, for economic purposes, may be defined as a location-specific good, i.e., something of value which can be altered only by a change in location. This simple definition covers a broad range of conditions that intrinsically possess a spatial dimension and affect our well-being. Thus a city may boast of its clean air, cultural attractions, absence of crime, good jobs, climate, and proximity to the ocean. All are conditions we value that depend on our physical location. Collectively such amenities are recognized as a major determinant of life's quality.

Individuals and families devote considerable thought and effort in seeking the "right place" to live. Residential location is a major determinant of employment and work satisfaction, leisure time enjoyment, housing and neighborhood, personal security, health, and child development. Private sector housing producers have a keen interest in what types of households are most attracted to these amenities because they must design saleable home-location combinations. Urban planners are interested in amenities since they are important in determining residential location and density patterns and community growth or decline rates.

Firms are concerned about locating where consumers, facilities, transportation costs, and work force characteristics, will most positively affect profits. Governments also study amenities which are part of the spatial patterns to be considered in establishing public policies for zoning, neighborhood public services, taxation, pollution regulation, highway and park construction, etc. This dependency on location conditions by households, planners, firms, and governments, means that amenities are the essence of urban and regional economics.

Objective of Amenity Measurement

Amenities are economic "goods," that is, they are items of value to the consumer. Although amenities are not bought and sold in the normal sense, their value is altogether real and evident in other associated conditions such as wages and land costs. This leads to the possibility of determining amenity gradients indirectly by observing differences in these prices between cities. The resulting attribute differentials can be used to adjust real wages such that workers and their families are equally satisfied to live in less desirable locations as well as preferred places. This equivalency is a characteristic of equilibrium conditions in which each household's choice of location maximizes its welfare and no family can improve its well-being by moving to another city. Thus measurement of

amenity value allows adjustment of wages promoting allocation of resources toward the desired equilibrium status.

Amenities Defined

The simple definition of a location-specific good, hides a number of characteristics that warrant attention. Initially it is important to recognize that amenities are exclusively established by location. To vary the amenity it is usually necessary to move to another location. It is the distinctiveness that location attaches to a good or service which is the amenity. This distinction may be incorporated in the nature of the good itself, its price, access to the good, or an option to utilize the good. However manifest, amenities are distinct for a given location and cannot be transferred or exchanged across space, i.e., they are non-fungible.

Amenities are important to both households and firms. In this chapter we will deal with the conditions of location that affect family well-being. Chapter 7 introduces the locational factors important to firms. In both instances behavior is motivated by intent to maximize utility (profits). Households locate where that combination of wages, amenities, and prices result in maximum satisfaction (a hedonistic model). Firms locate where that combination of resources, production function, and product markets result in maximum profits. The absence of complete information prevents perfect location in every instance, but the intent to maximize utility continually drives the behavior of workers and firms toward such optimal allocation.

For individuals, amenities can be identified in the broadest sense as the overall environmental conditions affecting our well-being. They include surrounding physical conditions of climate, air quality, view, and recreational areas resulting from nature's manifestations (often labeled exogenous as largely beyond human control), as well as human instituted conditions of local public services, commuting mode and distances, crime level, etc., arising from our social, political, and economic structures. Together they establish the ambient "quality of life" of a given location, and are usually evaluated collectively, the contribution of a single condition being difficult to isolate.

Amenities that are freely available to any temporary consumer at no price, are called public goods. For goods to be partially public, the consumption by an additional individual does not equally reduce the level available to others. Sunshine is a pure public good; use of a local library which may become congested with heavy use, is a partial public good. Since public goods are non-exclusionary or free to non-payers, no potential customer has an incentive to pay. The good is therefore not attractive to private entrepreneurs. Because the government can

compel payment through its tax system, it becomes natural to look to the government to produce public goods.

Ordinary goods and services which are readily available in homogeneous units at a price which is independent of location are not amenities. However, there are locational aspects about even ordinary goods and services, in fact, almost everything consumed or undertaken has a locational aspect. Varying shipping costs result in distinctive local prices for even identical items. The amenity in this instance is not the good itself, but its relative price. Thus variations in cost of living is an amenity. However, cost of living will be separately treated here as a component of real wages. Local commuting distances and transportation mode, fine restaurant meals, convenience of a local library, community "life style," friendliness of neighbors, etc., establish an endless list of human activities with elements of location-specificity about them. The locational aspect of these activities is more that of access to the goods, than in the goods themselves.

Job opportunities are also distinctive for each labor market and consequently a significant location-specific amenity. In fact, without job opportunities, environmental amenities have little value except for retirement communities. From an amenity standpoint, job opportunities represent the range of employment possibilities in different occupations and in position levels within these occupations. Locational variation in salary for the same job is defined as a wage differential not an amenity. This distinction is necessary because workers make tradeoffs between real wages and amenities, so they must be clearly separated. Salary levels for a given occupation adjusted by cost of living are real wages, which, in various combinations with environmental amenities, establish wage-amenity packages some of which are equally satisfying to workers. This is the subject of the last section of this chapter.

Amenities come in bundles, that is all amenities must be taken together at a single location and point in time. Both the dimensions of any given bundle and the number of similar bundles is fixed, and they are scarce. For example, there are only a certain number of beach homes in a given shore community that possess an ocean view as well as the climate and surroundings of the area. The scarcity and demand for this single additional attribute makes beach houses more costly. Each amenity bundle, defined by its own distinct location, is slightly different from every other bundle, if only by the perspective of its view and adjoining neighbors.

The manner in which permanent access to such bundles is gain or loss is through the purchase and sale of residential property. This leads to use of lot or site prices as indicators of relative amenity value for home-owning residents. At present, the value

of an overall package of amenities can be approximated only indirectly in this manner, through the price of other things--notably land with which such amenities become inextricably related.

Extended access to an attractive environment is gained only through the cost of residency. An acquired location confers upon its occupant exclusive access to a particular set of environmental conditions, distinct to some degree for the given location. The location itself then is an excludable resource, i.e., use of it by any one party precludes its use by others. Any benefits specific to the location must be consumed in place, i.e., by living at the resident site. In this sense permanent access to environmental amenities is excludable and non-tradable. (Note, once access is gained, amenities are nonexcludable, i.e., the option to consume or utilize is shared equally by all residents in a given location.)

While the homeowner may have exclusive right to his particular set or bundle of amenities, distinguished from his neighbor by perhaps as little as the immediate topography, a majority of the amenities involved will be common and public. Further, the nature of most amenities are beyond the direct control of the individual. Amenity levels at a location are generally exogenous to the control of any individual, being a function of the natural environment and the collective action of local inhabitants and the larger residential, government, and commercial communities. The only way an individual can alter the amenities he or she faces is through geographical movement. Such is the distinctive nature of amenities.

In addition to affecting a family's satisfaction (utility function), amenities, to some degree, affect the consumer's income needs (budget constraint). For example, the availability of high priced fine restaurant meals encourages their consumption, raising the level of expenditures and hence income required. A short commuting distance affects employee utility by increasing free-time and also reduces the price of work trips, increasing income available for expenditure on other goods. Thus amenities should be viewed as inputs that structure and shift the household's utility function, i.e., the tradeoff between amenities and wages, and also viewed as determinants of the household budget restraints, i.e., required family income level.

Some other final observations on the nature of amenities include their durability which implies that both past and expected future conditions enter into their pricing; and, in regional markets, the intrinsic interrelationship between residential amenities and compensating differentials in real wages. This later relationship is discussed next.

A Hedonic Theory of Wages and Amenities

Households (worker plus family) react to differences in amenities by attempting to locate where their real wage-amenity package will provide the greatest satisfaction. If they are informed of superior alternatives, and able to move, households will continue to relocate until all are equally satisfied and no further movement will improve their status. These movements direct households toward an ultimate distribution which under conditions of pure competition equilibrium maximize and equalize their marginal productivity and wages.

The manner in which this movement comes about can be best explained by using indifference curves which is a traditional means of explaining consumer behavior. They provide an easily understandable visual portrayal of consumer tastes and preferences. In this application they can be used to explain household behavior regarding the tradeoff between higher real wages and better environmental living conditions.

The indifference curve of a single household is obtained by confronting the family with a range of choices among various possible combinations of real wages and residence living conditions. The assumption on which the shape of the curves is based is that the family can tell which of the various combinations yield equivalent satisfaction and which ones yield greater or less satisfaction. It is also assumed that households strive to maximize utility (happiness), hence the hedonic label.

A single indifference curve X_1 in Figure 1 shows the different combinations of real wages and amenities which yield equal satisfaction to a given household. Units of amenities per year of residency are measured on the horizontal axis and real wages (nominal wages adjusted for cost of living) per year are measured on the vertical axis. In reality, the varying level of amenities on the horizontal axis represents various residential locations, sometimes within a single city, or, more likely when the range is large, among various cities. However, the nature of the amenity bundle must be essentially constant across cities, so that movement to the right represents a fairly uniform increase in the same amenities. Thus a single indifference curve applies only to a limited number of cities with similar amenities varying primarily in degree.

All combinations of amenities and wages on one indifference curve are of equal satisfaction to the household. Thus combination A consisting of wage w_1 and amenity level a_1 provides the same satisfaction as combination B of a lower wage w_2 and higher amenity level a_2. The slope of the curve at any location shows the amount of wages the household is willing to give up for an incremental increase in amenities while still maintaining the

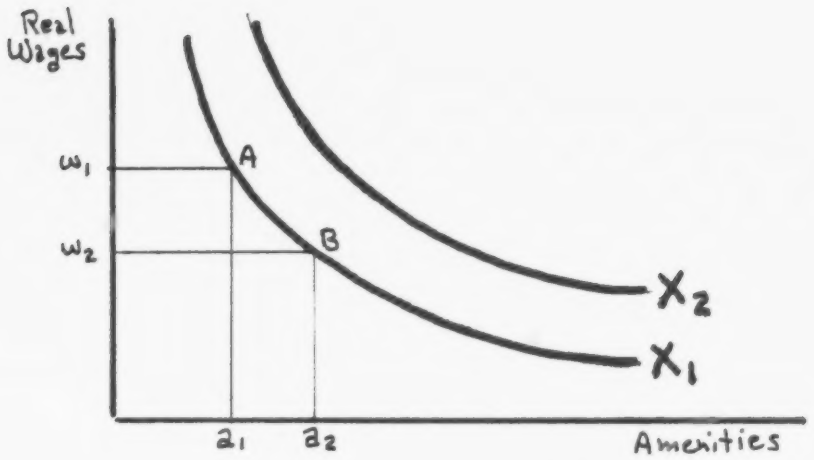

Figure 1

same level of satisfaction. Over time one or both wages and living conditions may improve resulting in higher levels of satisfaction at each combination. All positions on the higher indifference curve X_2 are preferable to those lying on the lower indifference curve X_1.

Indifference curves have three basic characteristics. First, they slope downward to the right showing that if the consumer's or household's satisfaction is to remain constant, giving up units of one commodity requires compensation by additional units of the other commodity.

Secondly, the curves are convex toward the origin of the diagram showing that the importance of an additional unit of one commodity substituted for another becomes progressively smaller as the transfer continues. In Figure 2, the household at point A with high wages is willing (but indifferent) to give up a substantial portion of their wages for a small improvement in amenities. At point B the household is relatively saturated with amenities and is willing to give up relatively large portions for an increase in wages. Where there is greater balance between wages and amenities, point C, wages and amenities are more equally valued and can be substituted for each other.

Third, the definition of indifference curves precludes their intersecting.

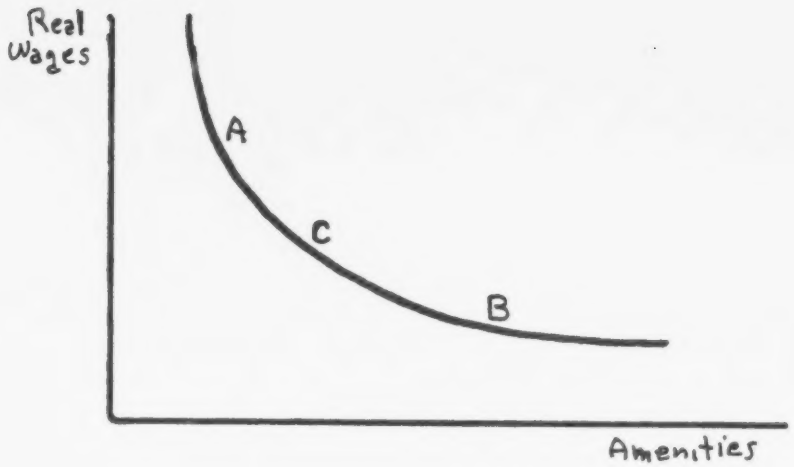

Figure 2

Figure 3 shows how indifference curves vary by individual preferences. In the left diagram, curve X is for a household that places high value on additional amenities and is willing to trade for substantially lower wages. Curve Y is for a household that favors wages over amenities. In the right diagram, curve X' depicts the preferences of a household that finds wages and amenities are not easily substituted, i.e., the household imposes limits on substitution beyond which the complementary relationships between the two commodities are most important. The household for the more linear curve Y' can easily substitute wages for amenities and vice versa, i.e., regardless of the level of wages or amenities the household is willing to substitute one for the other on a unit for unit basis.

An individual household develops from experience the family's own indifference curve regarding the relative value or tradeoff between incremental changes in wages versus residential living conditions. Individuals negotiating their salaries, or selecting among various wage-location options, intuitively take into account these personally assessed tradeoffs. Most wage negotiations however involved large groups of workers and/or structured salary scales. Also the largest differences in amenities occur between cities so that we are really dealing with the wage-amenity preferences of one city's inhabitants with those of another city. It is important at this juncture to realize that wage-amenity comparisons among cities can only be made for amenities that vary in degree not nature. Thus the wage-amenity preferences of residents in the southwest cannot be compared with those in the northwest because an entirely different set of amenities and household preferences are involved.

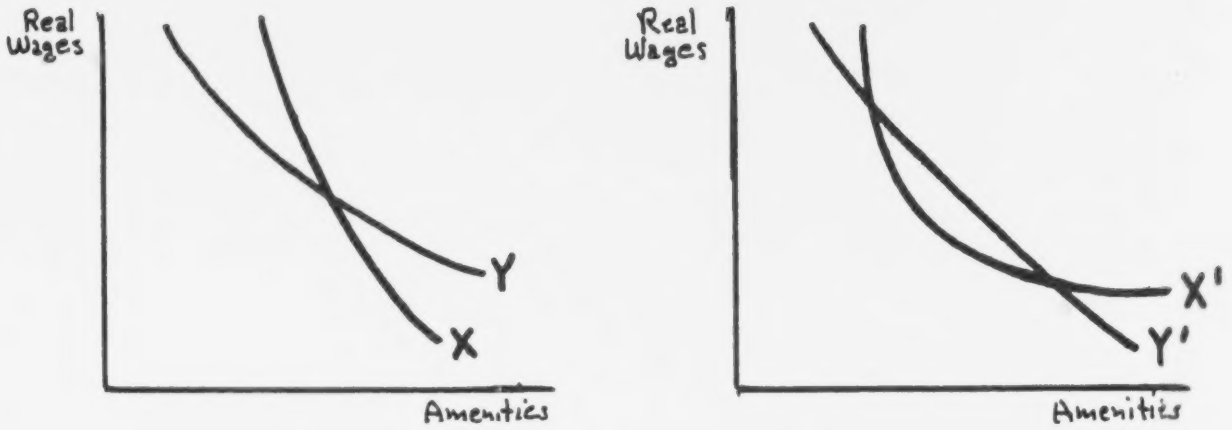

Figure 3

Within a region of similar amenities, indifference curve theory can be extended to groups of workers by holding the industry and occupation constant, e.g., accountants in banking. This regional industry-occupation curve is the envelop tangential to the family of individual city indifference curves. The city curves are simply the collective wage-amenity preference pattern for all city residents in the given industry-occupation. The regional envelope represents a constant level of wage and amenity satisfaction residents negotiate with firms in each city. These relationships are shown in Figure 4 and requires further explanation.

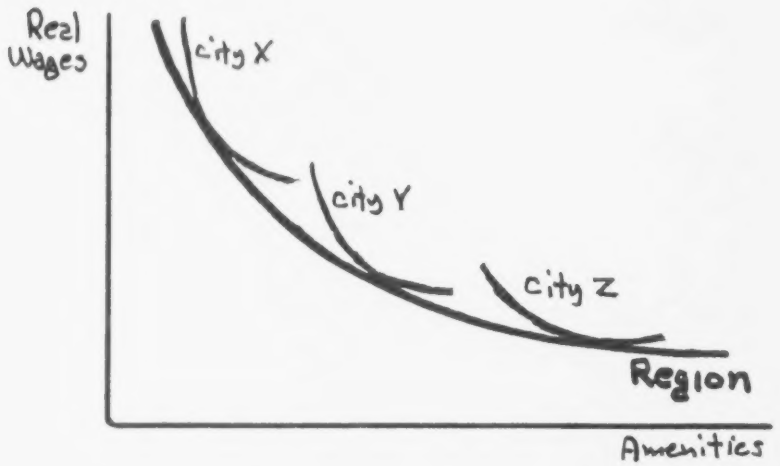

Figure 4

The aim of households is to achieve the highest possible satisfaction from their choice of a combination of real wages and amenities. If they have two job opportunities at the same wage rate they will choose the location with the superior amenities. If they receive two opportunities where the amenity levels are essentially equivalent, they will accept the offer with the higher wage rate. They seek in every instance to choose the offer that falls on the highest (to the upper right) indifference curve.

To understand how the regional industry-occupation indifference curve for cities is derived, consider the indifference curves X and Y of average households in two cities depicted in Figure 5. Households in city Y are less willing to trade amenities for wages than households in city X. Because city Y residents value amenities so highly they are willing to accept lower wages than city X residents at lower amenity levels and still be satisfied. Firms hiring workers will tend to offer the lowest wages at different amenity levels that will be accepted by workers. At low amenity levels these wage offerings are along line Ya.

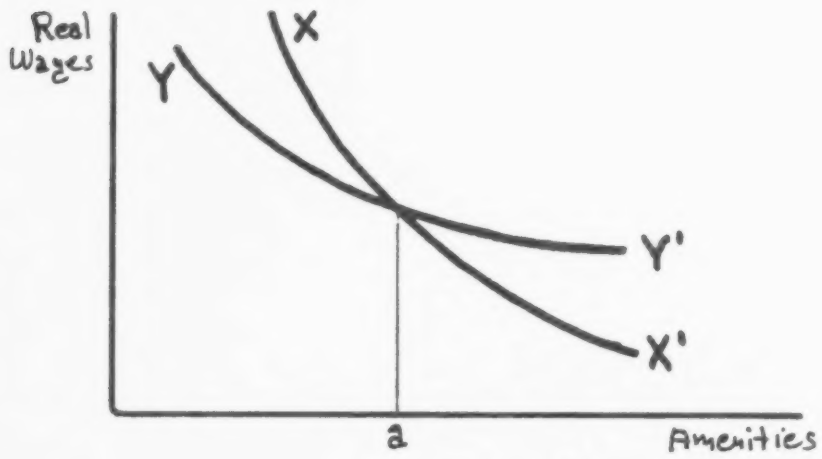

Figure 5

City X residents who greatly appreciate amenities, are more willing than city Y residents to sacrifice wages for the highest levels of living conditions. Again, at high amenity levels firms will offer the lowest acceptable wages which is along line aX'. The result of such negotiations is that the only portions of the individual city indifference curves which have a chance of matching the wage offers of firms lie along YaX'. The regional industry-occupation group indifference curve for both cities that emerges--combining the relevant <u>minimum</u> portions of each

individual city curve--is drawn in Figures 4 and 6 as a heavy line. It is along this curve that city combinations of wages and amenities at a minimum level of satisfaction will be met by firm wage offerings. The precise wage levels will depend on the amenity level provided at each city as shown in Figure 6.

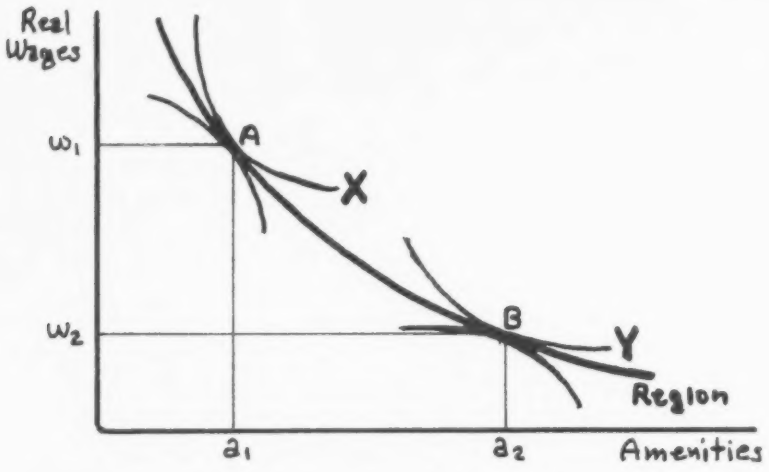

Figure 6

The regional industry-occupation indifference curve for cities is also the envelop of maximum firm offer curves. Firms will raise wages in each city until they are just accepted by residents together with the associated city amenity bundle. (Firms can pay these different wages and still compete in the product market because of offsetting locational production advantages. This will be explained in the next chapter.) This relationship, shown in Figure 6, can be used to show which households chose which city locations. A household with X preferences that favor wages over amenities will reduce its satisfaction level until its indifference curve corresponds to the offerings available, i.e., just touches the firm-city offer curve at point A. The worker in this household will then locate in city A with low amenities a_1 and be employed at relative high wages w_1 paid by firms in that city. The typical household with preference curve Y seeks a high level of amenities and will be hired at the family's highest feasible level of satisfaction, where the household's indifference curve just touches the firm-city's offer curve at point B, at low real wages w_2 in city B with high amenities a_2.

The matching of firms and city locations with individual households is thus not accidental or random. In the above illustration, both households will have maximized their satisfaction and firms in both cities will pay minimum accepted

wages. For the workers and firms in the industry-occupation in the region as a whole, firms in cities providing wage-amenity combinations along the industry offer curve will minimize wages; workers will obtain a uniform maximum level of obtainable household satisfaction from their respective wage-amenity city packages. This is called an equilibrium condition since no further benefits can be gained from additional moves.

Regional equilibrium in a industry-occupation results in a distribution of households among cities such that each family gains the same level of satisfaction from the real wage-amenity package received and there is no incentive to move. If a large proportion of families favor the amenities of certain locations, these cities will continue to grow with the added competition gradually lowering wages and bidding up the price of land. City growth may also induce dis-economies of scale such as pollution and congestion which reduce amenities. The real wage-amenity package will thus slowly become less attractive, eventually stabilizing city growth. Households will then choose to live in competing less desirable locations with larger real wages. In this way cities grow or decline with continuing changes in their real wage-amenity package such that the combination remains competitive with other locations. No city can long maintain a superior package without an influx of workers bidding prices up and in some ways lowering amenities; no city can long provide a deficient package without loss of workers and an eventual rise in wages improving its attractiveness.

Limitations of Indifference Curve Theory

A single regional industry-occupation indifference curve applies only to relatively homogeneous workers and cities, that is workers in the same industry and occupation with similar preferences in regional amenities, and cities with similar environmental amenities differing primarily in degree. Furthermore, the workers must be informed and mobile. Where workers have different wage-amenity preferences and cities offer different amenity bundles, the inter-city exchanges described in the previous section may not take place or may be severely restricted. Locations without universally appreciated attributes and with low real wages will continue to meet the preferences of a small number of dedicated residents. Although preferred by a majority of citizens, the wage-amenity bundle of attractive cities is not viewed by the committed residents of many small localities as a reasonable option. Thus the number of households attracted to the wage-amenity package of each location establishes the populations of towns and cities at what will be termed the "prevailing real wage." Within regions of similar amenities these prevailing wage-amenity packages are comparable. This topic is discussed in the next chapter

The use of amenity indexes based on region wide industry-occupation indifference curves incurs the limitation of being non-specific to particular households. There are no universally preferred set of amenities. People living in the southwest, for example, generally prefer a hot dry climate; inhabitants of northern regions are likely to prefer four seasons. Large city and small town preferences are irresolvable. This variance in tastes leads to failure of any index based on average data, i.e., a "representative person," from being applicable to specific individuals or small population groups.

The problem has been described by Rosen (see bibliography) and others as follows. Suppose two cities have amenities and real wages as shown in Figure 7. City A has higher wages, w_1, and inferior attributes, a_1; city B, lower wages, w_2, and superior attributes, a_2. There are two groups of workers (households), X and Y. If both groups have exactly the same preferences as shown in panel I, the real wage difference, $w^1 - w^2$, will exactly reflect the value of amenities for both groups. An index of city attributes based on this wage difference will be a true valuation of the incremental amenities involved as interpreted by both groups.

Panel II depicts a case where people who prefer amenities, curve X, live in city B, and people who prefer wages, curve Y, live in city A. Here the observed wage differential, $w^1 - w^2$, is not at all accurate, understating the value as viewed by group X (they value the differential equal to $w_a - w_2$), and overstating the value attached to the amenity differential as viewed by group Y (they value the differential equal to $w_1 - w_b$).

Panel III shows the case where group Y lives in both cities, and group X citizens live only in city B. The real wage differential, $w^1 - w^2$, accurately reflects the sentiments of group Y, but again understates the amenity differential as valued by group X ($w_a - w_2$). If the situation is reversed as in panel IV, with group X people living in both cities and group Y living only in city A, the real wage difference correctly portrays group X's preferences but overstates the difference as valued by group Y ($w_1 - w_b$).

These observations mean that indexes of relative amenity values based on average data, i.e., for a "representative person" are strictly accurate only if all people at every location have exactly the same tastes. When preferences differ, and they always do, an index based on averages applies only to those households at the margin of indifference, that is for people who chose to live at the location under consideration. This means that the indexes of amenity values in this study report relative amenity level (measured by site price) as established by <u>existing residents</u>, not by an independent outside consistent appraisal.

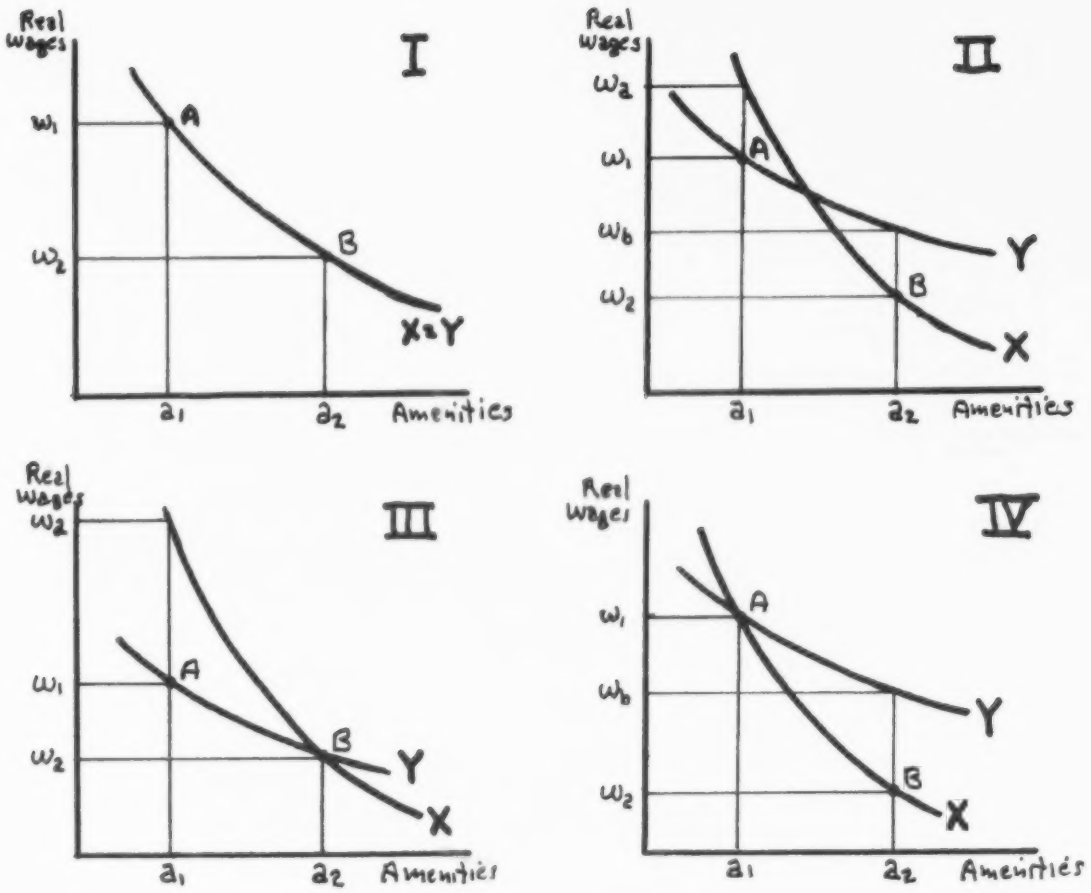

Figure 7

The slope of the two curves in Figure 7 show that residents favoring amenities tend to magnify their value; residents favoring wages, minimize their value. If most of the people living in a city prefer the featured advantage (panel II), amenity indexes for a "representative household" tend to understate attribute differences as valued by residents favoring amenities; and overstate differences as viewed by residents favoring wages. This observation also holds true for the situations in panels III and IV. Thus amenity indexes based on a "representative household," in tending to report a middle ground, are likely to understate differences when viewed by persons favoring amenities, overstate differences from the standpoint of persons favoring wages. This limitation must be borne in mind when employing the indexes of this study.

CHAPTER 7 REGIONAL PREFERENCE CURVES AND AMENITY MEASUREMENT

This chapter is concerned with empirical measurement of the relationship of real wages to amenity value as portrayed by regional industry-occupation wage-amenity preference curves. Recall from Chapter 6 that these curves involve a geographical region within which amenities are similar, differing primarily in degree not kind, and the industry and occupation of the workers involved is fixed. In order to broaden the applicability of our data base, the wage level employed will be real "prevailing wages" which represent the market established threshold wage for service type workers and similar occupations requiring minimal training. Prevailing wages are discussed in Chapter 10. Sufficient here is knowledge that the vertical axis of our indifference curves now reports real (adjusted for cost of living) prevailing wages which are applicable to a broad range of the non-professional labor force.

As will be explained in the last section of this chapter, amenity value in this study is measured by residential lot prices. However, the price of any scarce good including residential lots is dependent on supply and demand; demand in turn being a function of consumer tastes and ability to pay. Lot prices can exclusively reflect relative amenity value only if purchased at every location by the same group of consumers or consumers with similar tastes and buying power. Yet both the preferences and wealth of consumers vary from one location to another. The task is to isolate only the component of site price that reflects amenity value as determined by the preference curve with prevailing wages, exclusive of other exogenous factors affecting wage levels.

Factors Affecting Evaluation of Amenities

Four major factors establish the value resident households place on local amenities: wage-amenity preferences, area industry-occupation mix, resident bias, and household mobility. These factors must be reviewed prior to any discussion of amenity value measurement.

City Wage-Amenity Preferences The principle factor establishing the value of location attributes are the varying personal preferences of households and the locational production advantages to firms allows them to pay higher wages. As discussed in the previous section, these preferences establish the slope of the household wage-amenity indifference curve (also called a wage-acceptance schedule) for a given location, steeper curves for families preferring amenities, shallower for those preferring wages.

Family indifference curves may be summed for the population of a location resulting in a "representative household" preference curve for a given community or city. The valuation of amenities in each city is thus consistently determined by the preferences of a resident representative household. Employment and city population is established by the tangential intersection of this representative worker supply curve with a similarly derived collective offer curve by city firms.

The firm wage offer curve is established by the production advantages the location provides which includes possibly lower costs for capital, equipment, power, raw materials, and labor, and higher prices in the product market. These relationships were discussed in Chapter 6 and illustrated again in Figure 8. Greater detail introducing market action in two regions will be presented in Chapter 10.

What is important here is recognition that just as each city has its own unique attributes and population, so also each has its own inhabitant's preference curve and the collective offer curve of firms. Since the attributes or amenity bundles differ from city to city, they technically cannot be plotted on the same common horizontal axis as shown in Figure 8. This abscissa axis must report only increasing quantities of the same amenity bundle. A common wage-acceptance curve for a number of locations (the locus of tangency points between wage offer and acceptance schedules identified as R in Figure 8) can be devised only if all locations share the same or nearly the same amenity characteristics, varying only in degree, and all city households have similar wage-amenity preferences. Wage-amenity curves for certain limited geographical regions approach these requirements.

Area Industry and Occupation Mix Accompanying geographical differences in production advantages are differences in industry and occupation mix. New York City's northeast coastal location and massive concentration of industries and labor, for example, create a tremendous production center attracting a unique combination of industries and occupations. This combination establishes one of the highest overall wage levels in the country. The high wage level, in turn, allows workers to bid up residential lot prices in NYC beyond what would result from prevailing wages acting alone. Thus cities with production advantages likely have more workers in high salaried type positions, raising the overall salary level and residential lot prices. The task here is to adjust lot prices to reflect only value based on the wage-amenity preference tradeoff and not exogenous wage conditions due to geographical differences in industry and occupational mix.

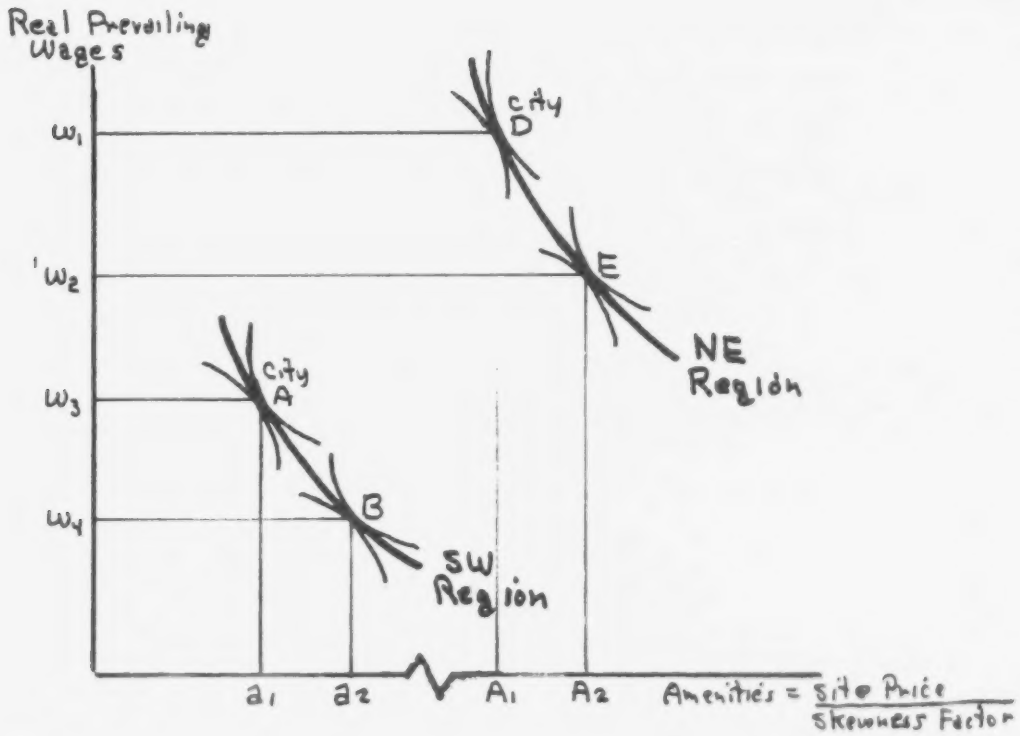

Figure 8

Useful here is the concept of area wages defined as the mean overall wage for all occupations in a given geographical area (city). Area wages reflect industry and occupation distribution[1] as well as productivity differences evident in

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[1] Skewness in occupations which elevates a community's average wage can be illustrated by many examples. Top executive jobs are more plentiful in major metropolitan areas than small urban communities. Physician positions are available where major medical centers are located. Federal workers and many highly paid executives and legal consultants work in the nation's capitol. In each instance the job distribution is skewed in favor of high paying professional positions resulting in an above average income level for the area and a bidding up of local prices including the price of residential lots. (Note this skewness is not the result of higher pay for the same occupations which is the prevailing wage.) In opposite fashion, a disproportionate number of low paying service type work exists in certain urban and retirement communities resulting in a below average income level and residential lot prices less than environmental amenities alone might warrant.

prevailing wages. The ratio of area to prevailing wages can be used to suggest the degree to which the industries and occupations in a location are skewed toward high or low paying type positions. Then, dividing residential site prices by this occupational skewness factor provides some adjustment of residential site prices to account for worker purchasing power beyond that of prevailing wages.

The regional wage-preference curve diagrams (as in Figure 8) then become measured as follows: the vertical axis reports real prevailing wages; the horizontal axis of amenity value equal to residential site price divided by the occupational skewness factor.[2]

The degree to which this skewness in occupational levels exist, as measured by the area/prevailing wage ratio, is shown in Table 2. Cities where residential lot prices most likely reflect a positive skewness of occupations (toward high paying type positions) include Washington,D.C., New York City, etc. Cities with the opposite skewness (toward low paying type occupations) include most of the smaller urban areas in the United States.

Resident Bias A third factor (really a preference component) affecting the evaluation of amenities is the tendency for residents to favor local conditions. Long term inhabitants of an area make attachments to the community, cultivate friendships, appreciate certain subtleties of the area, and generally are more appreciative of their circumstances than an

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[2] The vertical versus horizontal ordinates for indifference curve analysis for any given location are:

(1) Prevailing wage/CLI versus Site Price/Occupational Skewness

where Occupation Skewness = Area wage/Prevailing wage

substituting, eliminating common terms, and rearranging we have

(2) Area wage/CLI versus Site Price

Equation (1) and (2) are exactly the same mathematically and the resulting indifference curves are the same shape. Equation (2) means that for at a given location, preferences are between actual real area wages and raw site prices. However area wages are of little importance to the individual workers who is concerned with prevailing wages as they may be relevant to his industry and occupation. Thus the plotted diagrams are based on equation (1) measurements.

outsider might recognize. Residents thus tend to overvalue local attributes compared to an impartial external assessment. To the extent that this upward bias is uniform throughout the country it has no affect on relative amenity index values. Where populations are stable and community allegiance has had time to develop, location attributes are likely to be overstated by local evaluation; where allegiance is low as likely in transient communities, amenity evaluation may be undervalued. This bias is evident in the vertical direction of the empirically derived regional wage-amenity preference curves of Figure 8 which suggests the reluctance of households to move for any change in wages. Geographical differences in this bias factor are not available.

Household Mobility Another condition affecting amenity evaluation is worker or household mobility. The mobility of residents is reduced as their job tenure increases. Commitment to community and friends, job security, accruement of retirement benefits, the cost and shock of displacement, etc. all contribute to this immobility. Also, workers are often ill informed of other job opportunities, particularly at distant locations. Where populations are particularly stable and uninformed of alternative jobs and living conditions, overvaluation may be more extensive. Geographical differences in the mobility capability of households are not available.

Empirical Regional Wage-Amenity Preference Curves

Regional preference curves can be interpreted from the empirical measurements of real prevailing wages and site price adjusted for occupational skewness. Two such curves, for the Southwest and Northeast regions are illustrated in Figure 9. Recall that substantially different amenities are being measured in the two regions (although uniformly "valued" by site price), which requires a discontinuity in the horizontal amenity axis. This empirical evidence suggests that residential site price may be a reasonable proxy for the gradient value of a given amenity bundle.

Note that the two regional wage-acceptance schedules in Figure 9, have different slopes. They would eventually intersect, even though the portions drawn are above and to the right of others. Each curve represents essentially the same level of satisfaction as viewed by the unique preferences of residents in each region. The fact that the different attribute bundles for the cities are plotted on the same horizontal price axis accounts for their displacement about the chart. The Southwest curve, for example, reflects the lower real wages of this less productive area, a bundle of hot dry climate associated amenities including job opportunities partially unique to the desert, all available at relatively low land prices, and

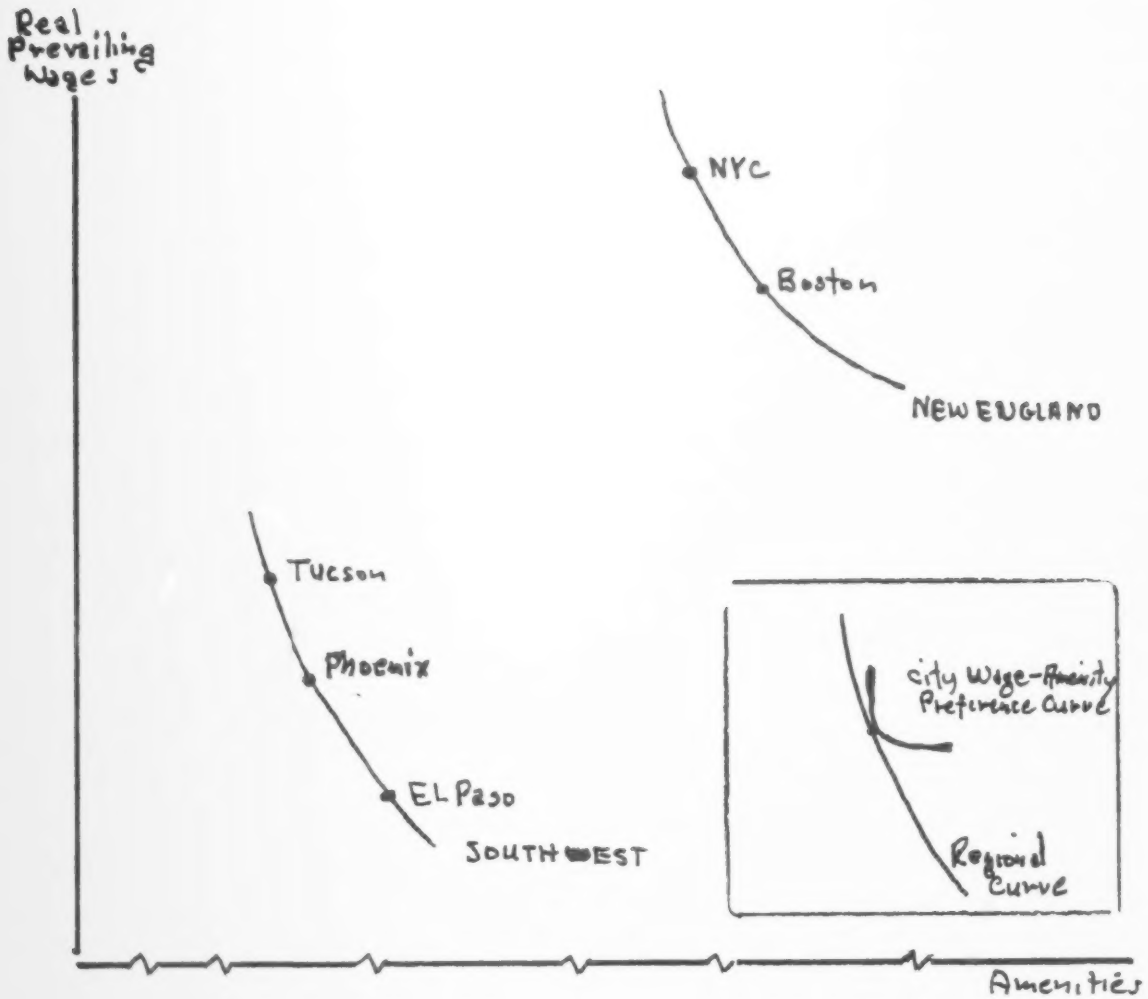

Figure 9

residents who prefer this tradeoff. The Northeast curve reflects the high real wages of a large industrial and commercial areas, a bundle of metropolitan amenities at high land prices, and residents who especially value this combination. The two conditions are not part of the same indifference curve family, both are distinct and cannot be compared on the same continuous chart (hence the discontinuity of the horizontal axis).

The near right angle shapes (so assumed) of the individual city resident preference curves (shown in the box within Figure 9) that make up the regional curve, suggest that residents prefer their present location and are unwilling to accept a change in wages for an alternative location, i.e., within the region wages are a poor substitute for location. The slope of

the regional indifference curves will be used later to establish the relative tradeoff between amenities and real wages in establishing "equilibrium wages." See the last sub-section of this chapter.

Amenity Measurement

Amenities have proven difficult to measure because of their diverse and qualitative dimensions, which also prevents any easy summation. Although a great deal of effort goes into their production and maintenance, amenities are not individually bought and sold so their value cannot be determine through any direct prices. In the past, the abundance of some amenities like sunshine and clean air over vast areas of the country, have made them free for all. Now with smog and pollution, even these environmental conditions are becoming scarce in some areas with an associated "price" to the consumer.

There are a number of studies which attempt to directly quantify various amenities. The Rand McNally Places Rated Almanac (see Bibliography) is a good example, "rating" locations according to mildness of climate, comparable housing costs, availability of health care, absence of crime, commuting and transportation, quality of education, access to recreation, local living costs, etc., plus overall community "scores." This is necessarily highly subjective, especially the selection of the various factors and their weighting.[3]

A second common approach to amenity measurement is to identify their value through the prices of other things they influence, most notably wage rates and urban land values. The wage rate studies attempt to determine the wage differences among locations that result from the need to compensate workers for urban dis-amenities. The great difficulty here is extracting the single effect of amenities on wages from the multitude of other market causal factors. We have chosen residential lot prices as the single best direct indicator of the relative value resident families place on the collective amenities of a community, i.e., all locational attributes.

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[3] The authors of a recent study of quality of life based on 16 amenity components for 285 metropolitan areas, found "...no statistically significant correlation between our Quality of Life Index ranking and either of the other two rankings." (the other two rankings being Places Rated and a 1976 study by Liu.) See "A Revealed-Preference Ranking of Quality of Life for Metropolitan Areas," by Berger, Blomquist, and Waldner, see citation in Bibliography.

Full recognition must be immediately given to the fact that because of major near irresolvable differences in household preferences, lot prices reflect relative amenity value primarily within a given region of similar attributes appreciated by the majority of local inhabitants. Inter-regional comparisons are relevant only for households holding a universal appreciation of amenities without bias. Note also that any indexes of amenity value report only relative levels, not absolute worth. A dollar value is attached to amenities only when the tradeoff with wages is established. Finally, not attempt is made here to measure any marginal aspect of amenities such as the marginal willingness-to-pay for an increment of amenities.

The value of residential location, or site, depends on the benefits which the owner derives. These benefits are secured in a special manner. First, they must be consumed in place, such as a view or nearby such as use of a public library. Second, to gain permanent access to the amenities, a residential site must be purchased. The site itself, being the only location with its exact set of characteristics in existence, is non-tradable and its supply absolutely fixed. The property is therefore an excludable resource; i.e., use of it by any one party precludes its use by others. However, public goods associated with location, such as climate, are nonexcludable to the casual visitor, that is climate is temporarily available to anyone while in the general area.

Most empirical work has attempted to measure the relationship between certain amenities and either land values or housing values. The idea is that the value consumers place on location is capitalized into land and/or property prices. If total property value is used, the difficulty of holding housing quality constant must be overcome. The nature of these earlier works can be obtain from the bibliography entries, notably Barton Smith. The results vary greatly due to differences in the structural models, the empirical techniques, and data bases used.

In investigating the use of lot prices as an indicator of amenity value one can first note that while the price of land for farm and commercial use is based on both the marginal value of a particular site over alternatives and the size of the lot, the importance of this second size component is far less in determining the value of residential lots. (We are speaking here of lots permanently zoned for residential use without potential for subdivision.) The principle determinant of residential lot value is location. Assessing lot value on a unit (per square foot) basis subjects the important overall price to the variegated distinctions of lot size which has little to do with overall value. Small lots with modest amenities may have a high unit price completely at odds with the sites' overall value. The size of very large lots becomes a positive attribute itself, but here the coefficient of value is reversed. Large lots with good

locational value have extremely small unit price, again opposite to total value.

Use of Site Price The approach taken in this study recognizes the creditability of assessing the value of amenities through actual market pricing. Stated differently, the real relative value of living in two locations is the price difference buyers are willing to pay to reside in each. The best evidence of this willingness to pay for location is site price, i.e., the relative attractiveness of various locations is indicated by the price buyers are willing to pay for property sites to locate there. The buyer normally takes into account his preferences for the attributes of a location versus the real (prevailing) wage level paid as evident in the wage-amenity preference curve. Workers chose that combination of prevailing real wages and residential property location such that their monetary and non-pecuniary satisfactions are maximized.

Property site price is the exclusive measure of detailed location preference. Other factors associated with property ownership such as structure cost and property taxes are taken into account by the buyer in appraising site value, but they are components of cost of living which may or may not reflect location value. In other words, an inexpensive house can be built on land of great value. It is the land, not the house, that reflects the location specific amenities of the area. Property value reflects the worth of all location specific amenities including cost of living and its housing and property tax cost components.

Recognize that we are considering here only permanently zoned residential lots which are not subject to commercial speculation including the fact that they are usually too small for subdivision or division is prohibited by local ordnance. Without the possibility of commercial speculation the price of the lot reflects only the buyer's preference for the location.

What is sought in site pricing for estimating the value of locational amenities is the relative fixed cost differences between parcels typical for each location independent of the variable costs associated with lot size. That is, what would be the price of equal sized typical lots in various cities assuming the size chosen is equally available at each location. (It must be assumed that lot size and location quality in the same city are independent.) In reality, the average size of lots varies considerably from one city to another (although not so much within cities) indicating that what is "typical" in one location is not in another. Also, neither the available data on total lot price or unit price per square foot equals fixed costs.

Two extremes illustrate the problem. In large cities, with expensive lots of fairly restricted but uniform size, the

variable costs associated with the relatively limited range of available lot sizes are small relative to the high fixed costs. In these instances, the city mean value of site total price are only slightly higher than, and may be used to represent, fixed costs. Thus total rather than unit price is the better indicator of the buyer's evaluation of location where lot sizes are restricted. In these instances the size of the lot is location specific and should be considered a non-transportable amenity, i.e., the buyer takes into account the lot size restrictions of a location in establishing the market price.

In opposite fashion in rural areas with adjacent farm land, where expansion is feasible and relatively inexpensive, there is a great range of residential lot sizes usually available and consequently the total lot price depends on the buyer's preference. In these instances site price on a unit bases per square foot, in reporting the large variable costs involved, best reflects the relative value of land location. Unit pricing is, of course, the way in which commercial and farm land is sold as are all goods with a productive capacity related to size or amount.

It is judged that in most cities and urban areas, the buyer of existing houses has little range in lot sizes from which to chose so that <u>total</u> lot price is the more realistic measure of location value. Even new homes constructed in residential parks generally have fairly uniform lot sizes within the development. The major exception to this rule is the ability of buyers to select various lot sizes from large new tracts of unimproved virgin land.

<u>Amenity Value = Site Price/Occupational Skewness</u> The value of non-transportable location specific amenities described above is estimated here by the total price of residential sites for single family homes reported by the Department of Housing and Urban Development, adjusted by the occupational skewness factor which reflects exogenous wage differences altering consumer buying power. Recall that this adjustment is to account for greater or less buying power among the population due to the presence of higher or lower paying type jobs, quite apart from any prevailing wage differences. Since we are only concerned with the relationship between real prevailing wages and amenities, correction must be made for this exogenous differences affecting demand.

The relative value of amenities (adjusted site price) is expressed as a population weighted Amenity Index (AI) with the U.S. average equal to 100. AI values are reported in Table 1. HUD site prices for 242 cities are reported in Tables 2, together with the occupational skewness factor and the resulting Amenity Index ratio. An index value of 60 means that the value of amenities (as evident in adjusted residential site prices) is

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60 percent of the national population weighted average of 100. An index of 130 means that amenities in that location are valued 30 percent greater than the national average.

Equilibrium Wages and Amenity Weighting Equilibrium wages will be defined in Chapter 9 as the uniform wage level that would result under pure competition equilibrium resulting in the most efficient use and highest return for all resources. Equilibrium wages are equal real wages at each location adjusted for the value of local amenities. The problem addressed here is determining the weight which should be attached to the amenity adjustment. An estimate can be made based on the relationship of amenity value to real prevailing wages as shown in Figure 9. The slope of the indifference curve for a given region suggest the relative value households place on real wages versus location amenities.

The formula for equilibrium wages is:

Equilibrium wages = 1 / Cost of Living
- Indifference Curve Slope x (Amenity Index - 100)

Typical slopes of the indifference curves can be determined from the different regions shown in Figure 9. On average a median level value is 1.5, that is a 10 index unit increase in amenities is worth a 15 unit decrease in real prevailing wages. If a unit of prevailing wages is worth $300, then an index unit of amenities is worth $450. This suggests that within regions, households tend to highly value the amenities of their present location and are reluctant and/or find it difficult to move.

We have explained that the unique wage-preference curves of households in different regions creates a family of regional indifference curves for the nation. Each curve establishes a regional labor market. Within these markets equilibrium wages can be defined by the formula above, but not so easily between markets. Thus equilibrium wages within the Southwest region can be defined by adjusting the area's prevailing real wage by local amenity values according to the slope of the regional indifference curve. An entirely separate market must be developed for each region using that region's prevailing wages, cost of living, amenity values, and local indifference curve. When each region is in equilibrium, wages throughout the nation will be in equilibrium although a single wage-preference indifference curve is not applicable.

PART III WAGES

CHAPTER 8 MEASUREMENT OF PREVAILING WAGES

This chapter deals with the measurement of "prevailing wages," wages set in each market by local supply and demand. Geographical indexes of prevailing wages attempt to measure the differential effects on local supply and demand of such locational factors as production economies, urbanization, unionization, cost of living, and quality of life. It is the effects on salaries of these locational factors alone that must be measured; all other conditions must be held constant, such as the occupation and industry, and the workers quality, training, experience, age, sex, etc. On the demand side, firms in the selected industry must be of similar size and profitability and offer similar working conditions.

All these factors cannot, of course, be held constant. An attempt is made here to select only industries which are likely characterized by a high degree of uniformity in these factors across the nation. Preliminary study of certain industry and specific occupation data[1] suggests that while there appears to be an overall hierarchical wage structure by occupation, by industry, and by location, the patterns of individual occupations within specific industries is extremely erratic.[2] Thus the importance of industry selection is critical to measurement of prevailing wages.

The first section if the chapter introduces the basic conditions that must be held constant from site to site if an exclusive measure of wage differentials is to be derived. The

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[1] The principle and perhaps exclusive source of salary data by occupation, industry, and geographical location is the Industrial Wage Survey, U.S. Bureau of Labor Statistics. Surveys are conducted periodically for 27 manufacturing and 18 non-manufacturing industries, reporting salary data for primary occupations by selected metropolitan areas. Levels within occupations are defined by job descriptions.

[2] Some indication of a wage structure by occupation and industry is suggested by evidence that in many locations (1) banks and department stores pay switchboard operators more than they pay clerks, (2) banks generally pay more to both occupations than do department stores, and (3) both banks and department stores in high cost cities pay higher salaries for both occupations than they pay in low cost cities.

In contrast, evidence also indicates that (1) banks pay secretaries more than computer operators in some cities, less in others, (2) the ratio of salaries for bank clerks in certain cities is reversed for department store clerks. Source: Industrial Wage Survey, U.S. Bureau of Labor Statistics.

second section reviews the theory of how wage differentials persist due to geographical differences in environmental attributes of value to households, productivity advantages to firms, and the wage-amenity preferences of residents. The full theory is presented in Chapter 10. The final section outlines the procedures employed to derive an empirical measure of prevailing wages.

Conditions Required for Geographical Comparison of Wages

The term "wages" is used throughout this study in a comparative economic sense, i.e., the nominal (dollar amount) price in a given market for standard employment of human resources of fixed quantity and quality. These requirements are approached for labor within a given occupation and industry with similar employment working conditions. Specifically, the "prevailing" wage estimates reported in this study apply primarily to labor of near fixed quality within service type industries. Only relative wage values are reported, i.e., wage levels at a given location expressed as a ratio of a standard base, in this instance, the U.S. average equal to 100.

To establish geographical wage relationships the following conditions must be approached:

1. The wage data must be limited to a single occupation of fixed job description within a single long-standing industry employing large numbers of such workers. To be comparable, wage differentials should not include differences resulting from varying the industry or occupational mix at the locations in question. Industries are not representative if they exhibit pay variations due to geographical differences in profitability. The more extensive pay distinctions for the education, skills, and physical abilities required of different occupations must also, obviously, be excluded.

Limiting comparisons to single long-standing industry employing many workers in given rank-and-file type occupations increases the likelihood of approaching conditions of pure competition, or at least that firms within the industry are seeking equilibrium. Near equilibrium conditions means that geographical wage differentials are more likely to be stable, less subject to temporary volatility hindering comparability. However, the industry must not be so large as to be able to influence wages to any extent.

2. The industry is characterized by conditions approaching pure competition and equilibrium status. These conditions are approached when: (1) individual workers and firms have little if any influence on wages, (2) wages are generally free to move up or down with little restraint, and (3) a substantial degree of

worker mobility exists. Partial equilibrium, i.e., pertaining to a particular economic unit such as an industry, is approach when sufficient time has allowed capital and labor to move with little remaining incentive to change because worker satisfaction and firm profits are high. How wages are set as equilibrium is approached under these conditions is explained in Chapter 9.

3. The economy is stable--free of major fluctuations up and down--and high levels of worker employment exist.

4. Working conditions within the firm (or outside where field work is required) within the industry are similar, including safety, comfort, surroundings, hours of employment, training opportunities, etc., except for minor variations of no particular pecuniary value, or with offsetting wage compensation. Fringe benefits are equal in real value or have no geographically differential impact on wage negotiations, i.e., worker satisfaction from fringe benefits are equal in all locations.

When working conditions are not the same, the extra amount firms must pay to attract workers is called a compensating wage differential. Compensating wage differentials are the price at which various qualitative features of employment at one firm or location versus another are bought and sold. Such differentials are not included in this study and must be separately established by worker-management negotiations.[3]

Persistent Prevailing Wage Differentials Are Set by Three Factors

Labor is a commodity traded in resource markets. The wage level is the contracted price firms are willing to pay and employees willing to receive for their labor. Many factors govern this labor market competition and resulting transacted

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[3] Essential to the theory of compensating wages is the assumption that workers seek to maximize their satisfaction or utility rather than dollar income. If workers sought to maximize only income, they would always choose the highest-paying job available to them. This behavior would cause reallocation which would eventually cause wages to equalize across the jobs open at the equilibrium wage level, as stated earlier.

In contrast, compensating wage differentials will rise if some workers prefer lower paying positions with better working conditions. This behavior allows firms offering the lower-paying jobs to be competitive. In this instance, equilibrium wages are not equal in every location, but rather the overall utility from the wage and nonpecuniary aspects of the job tend to equalize for the marginal worker.

wage level. As outlined in the previous section, in order to make comparisons, it is necessary to hold some factors constant, namely, the industry, occupation, working conditions within the firm, and employee skill level. Keep in mind that throughout this text we will be observing this limitation, i.e., discussing homogenous workers except for their amenity preferences.

With these restrictions, persistent geographical differences in wage levels are created by three major factors:

(1) Production advantages to the firm due to location.
(2) Local cost of living.
(3) Locational attributes of the community and the wage-amenity tradeoff preferences of local residents.

Firms always attempt to pay the lowest wages possible (for given quality workers) but must compete for employees in the labor market. Firms compete by paying the prevailing wage rate which is offset by any locational production advantages they may possess. Workers similarly always seek the highest real wages (wages adjusted for cost of living) they can obtain but also must compete for these wages against other workers. Workers successfully compete by being willing to tradeoff wages for preferred amenities. This trade-off is called their "wage-amenity preference schedule."

If no geographical production and amenity differences existed, firms freely competing at different locations would eventually hire similar numbers of workers at the same nominal or actual dollar wage. This situation seldom occurs because production advantages and quality of life conditions vary throughout the country, from region-to-region, city-to-city, and neighborhood to neighborhood.

Firms are afforded production advantages by locations with access to raw materials, low cost power, large consumer markets. These advantages allows them to pay higher wages in some locations if necessary to compete for workers and still make profits. Higher wages may be required if the area is unattractive to residents. Firms without these advantages must pay workers less if they are to broadly compete. This lower pay is easily possible in attractive areas where a large number of workers bid down wages. In unattractive areas, firms without production advantages are still able to hire smaller numbers of employees from among those inhabitants who distinctively value the location.

Geographical regions can be defined within which a fairly common set of basic amenities, such as climate, topography, lifestyle, and city size exist. These regions tend to operate as separate labor markets. Residents generally prefer their present conditions and are more likely to consider other job opportunities when these fundamentals are preserved. They are

less willing to entertain movement outside their region because of long term attachment and commitment to the environment. This association includes the build-up of job seniority and retirement benefits, value of local relatives and friends, loyalty to community institutions, etc. This attachment restricts household mobility which defines the size of the labor market. Thus regional labor markets are areas of common amenities in which households are generally free and inclined to move about. Exceptions to this rule are uncommitted young adults newly entering the labor force, and recent retirees with a new set of locational preferences.

With a reduced range of amenities, variations of production advantages and cost of living are most important in determining wage differences within regions. In the sparsely settled Southwest region for example, wages are most likely determined by firm production advantages associated with the size of the local (city) market and distances to adjacent markets, together with cost of living. These conditions being decisive in what otherwise is a relatively homogeneous desert and mountain environment.

Comparison of wages within regions is valuable because households have similar amenity preferences, making wage differences important in locational decisions. Inter-regional wage comparisons are less meaningful because whole new sets of substantially dissimilar basic amenity preferences are introduced. Thus families living in the southwest may find no additional salary will suffice to prompt them to exchange what they feel is an attractive sunny dry climate for the frigid winters of the Upper Midwest. Cross-regional wages may be similar to the degree they share the markets for certain types of labor, compete in overlapping product markets, and have similar production advantages.

Although most firms and governments must pay prevailing wages to compete in the labor market, an exception may exist. Nation-wide firms may seek equity in wages among employees <u>within their firm</u> by establishing uniform equal real wages, i.e., by setting nominal wages proportional to local cost of living. An additional sophistication is further adjustment for variation in amenities as determined by some standard measurement. This form of compensation is usually initiated through union bargaining. The resulting "amenity adjusted equal real wages" may be higher <u>or lower</u> than local prevailing wages. If lower, employees will likely express some immediate dissatisfaction. However, this negative differential is less significant to employees intending career tenure with the firm. Another problem is securing general acceptance of a single standard measure of amenities. The use of residential site prices in this connection is presented in Chapter 7.

Wage Definitions Summary

The most commonly described wages in the United States are real wages. Real wages are nominal (actual unadjusted dollar amount) wages adjusted for cost of living. Wages which retain their purchasing power are deemed a fundamental right of employees. Cost of living adjustment (COLA) over time for inflation are a common occurrence in many negotiated labor contracts. Adjustment of wages for geographical differences in cost of living is perhaps equally important but far less a bargaining issue because of difficulties in measuring such cost differences.

In formula form:

REAL WAGES = NOMINAL WAGES/COST OF LIVING

Equal real wages require that the nominal wage be equal to the cost of living.

When people including economists speak of wages, they are generally talking about prevailing wages. Prevailing wages are the wages set in a competitive market (for a given industry, occupation, etc.) when all factors of supply and demand are generally free to operate. The prevailing wage is set where local supply and demand are equal; supply being established by workers seeking the highest real wage and local amenity combination consistent with their preferences; firms paying the lowest wage possible consistent with their labor requirements and locational production advantages. Prevailing wages are generally not comparable across diverse regions because of differences in worker preferences establishing whole new wage-amenity preference schedules.

Prevailing wages adjusted for cost of living are called prevailing real wages. Workers always seek that combination of prevailing real wage and local amenities which maximizes their satisfaction. Again, amenity preferences across regions may vary greatly, reducing the cross-region comparability of prevailing real wages.

Workers may negotiate for equal real wages at all locations of employment covered by a union contract. There are only a few instances in the United States of this type of contract (see footnote 1, Chapter 3). At any given location these equal real wages may be greater than, equal to, or less than the prevailing wage. An additional sophistication is the adjustment of equal real wages for perceived amenity differences, that is paying workers slightly less for locational quality of life differences generally agreed to be superior by all involved workers. Workers employed in less attractive areas are paid slightly more than equal real wages as compensation for this disadvantage. Equal

real wages adjusted for universally agreed upon amenity values are called "equilibrium wages" because they equal the uniform real value of wages reached when firms operating under conditions of pure competition approach equilibrium. No employment contract stipulating equilibrium wages is known to exist.

A frequent misunderstood and misused wage measurement is area wages. Area wages is the average wage of all workers (all industries and occupations) in a given location. It reflects not only prevailing wages but also wage differences due to the mix of industries and occupations. High area wages are usually due to the presence of many high paying type industries and positions in an area. There may be no associated differences in prevailing wages. Area wages indicate the collective relative wealth of wage earners. This is of little importance to the individual workers accept for the advantages associated with the relative wealth of the community. Area real wages are area wages adjusted by the cost of living to establish comparable purchasing power.

Measurement of Prevailing Wages

The first task in attempting to measure geographical differences in prevailing wages is the selection of industry and occupation. Theoretically, each occupation in each industry could have its own distinct wage pattern. Practically, because of the similar skill and training requirements of many occupations and the sale of these resources to many competing industries in the same labor market, the gradient distribution is greatly reduced. Some industries, however, such as mining and agriculture, have exceptional locational advantages that may be reflected in entirely unique geographical wage differentials of little relevance to other industries. These geographically sensitive industries must be avoided.

Division of prevailing wages by major occupations and industries, while theoretically feasible, would rapidly expand the data base beyond reasonable bounds with progressively less utility. Nor does the present data limitations encourage even starting such division. Fortunately, a single measure of prevailing wages broadly applicable to a wide range of industries and occupations, is most valuable and also feasible. This objective is attempted here.

To secure such a broadly useful and geographically comparable measure of prevailing wages, the following restraints must be present at each location:

(1) Each industry reported must be common and plentiful, non-regulated and non-unionized, and labor intensive with limited potential for geographical production advantages unique to the

industry.

(2) Firms within the industry must compete in a reasonably free competitive labor market. They must exhibit similar production functions and exhibit similar collective median sizes. Working conditions within the firm must be similar or offset by compensating wages. Fringe benefits must be effectively equal.

(3) Wages must be for a specific common representative occupation, or fixed group of occupations. Job descriptions involving required education and skill level must be fixed.

With these requirements, prevailing wages are more a concept than a measurable reality. The problem is that no agency collects wage data with these restraints and in this detail, nor are they ever likely to do so. The closest, and yet at some distance, are Bureau of the Census data by location and industry. (Other data in greater detail by industry and occupation is too sparse at the present time.) By careful selection of industries that appear to exhibit the above characteristics, and use of median values to eliminate deviant values, a reasonable attempt can be made to approximate the above conditions.

The prevailing wage measurement attempted in this study is the median wage level for all employees in retail trade and services type industries. A majority of employees in these industries fall within a fairly narrow range of sales, administrative support, service, and repair type occupations, with pay rates likely representative of those for similar occupations in other industries. Furthermore, the industries chosen have limited potential for specialized locational production advantages. Thus the reported prevailing wages can be interpreted as the market established wage level of employees in typical lower to mid-level occupations, in service and related type industries that are generally not subject to competitive advantages afforded by location.

The source of data is the U.S. Bureau of Census' County Business Patterns[4] which yearly reports, by county, payroll and number of employed persons by two and three digit standard industry classifications (SIC). Recall that comparative wages may be determined from fixed occupational groups as well as for individual occupations. An attempt is made here to establish this consistency by selecting only those industries likely to exhibit fairly uniform occupation patterns. Beauty shops, for example, wherever located, likely employ a manager (owner), hair stylists, and a few assistants. The assumption is made that for

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[4] County Business Patterns (year), Bureau of the Census, U.S. Department of Commerce, U.S. Government Printing Office, Washington, D.C.

the chosen industries, any geographical variation in the mix of employees is likely to have minimal affect on overall payroll levels. One cannot however rule out the possibility that certain unique environmental conditions may levy unusual requirements on local staffing requirements, skewing the average wage. To eliminate the effect of possible extremes, median wage levels were determined for seven selected industries.

A second major data problem is the absence of a full-time-equivalent employee count. County Business Patterns reports only a March 1st headcount. Establishing unit wages by dividing total payroll by this headcount introduces the effect of geographical variation in full- to part-time ratios. No correction factor is known. The dimensions of error introduced by such variation in staffing could be a substantial in some locations. Yet is reasonable to expect that the service industries selected share throughout the country similar seasonal needs for part-time employees.

Selection of the industries which may meet the stated conditions, proceeds as much by eliminating the obviously unqualified as determining the likely qualified. A number of categories--Agriculture services, forestry, fisheries; Mining; Construction; and Manufacturing, can be immediately eliminated because of the obvious locational advantages present. Transportation and other public utilities are subject to differing state and local government regulation. Finance, insurance, and real estate are each uniquely affected by geographical location. Further, all of the above categories are complex, employing a wide range of diverse occupations including many levels of managerial and professional and technical specialties. Substantial inter-spatial differences in occupational types, levels, and mixes are likely with consequently distortion of wage levels.

Three industry categories remain--wholesale trade, retail trade, and services. The dependency of wholesale trade on geographically related transportation costs rules out this group. The selected industry must then be made from the two remaining categories--retail trade and services. Recall again that the selection criteria stipulate that the industry must be labor intensive without geographical production advantages, firms must freely compete and have similar production methods, and, most critical, staffing patterns must be similar. This latter criterion means that the same mix and relative quantities of occupations must be present in all firms so that reported wage differences reflect differences for a standard set of representative employees.

Observing the above criteria, the selected two-digit[5] retail trade and service industries used for the prevailing wage measurements of this study are:

53 General merchandise stores
56 Apparel and accessory stores
57 Furniture and home furnishing stores
58 Eating and drinking places
72 Personal services (laundry, photo, beauty & barber, shoe, funeral)
75 Auto repair, services, and garages
76 Miscellaneous repair services (electrical, watch, reupholstery)

Mean 1987 wages for each of these industries for each of the reported counties were calculated by multiplying the first quarter payroll times 4.0, and dividing by the number of employees for the week ending March 12. The median for the 7 industry wage values was determined and indexed relative to the U.S. median equal to 100. This index is the prevailing wage relative measure reported in this study.

The reported prevailing wage indexes are estimates of the geographical wage level differentials established in the competitive labor market for representative employees in the retail trade and service industries. The data precludes any more rigorous interpretation.

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[5] Three-digit SIC sub-industries would have further narrowed the range of occupations. Comparison of median wages for 7 two-digit and 7 selected internal three-digit sub-industries reveal no significant differences. Data at the three-digit level is not currently available on floppy discs. To expedite processing the compilations were limited to the two-digit industrial division. Future study with additional time and resources should examine the possible improvement refinement to the three-digit level might provide.

CHAPTER 9 EQUILIBRIUM WAGES UNDER PURE COMPETITION

Persistent geographical wage differentials due to differences in cost of living, and location specific residential amenities of value to households and production advantages of value to firms, may be advocated as providing reasonable and fair industry-wide compensation to employees in a given occupation. These "prevailing wages" are set in the market place by supply and demand distinguished at each location by local amenities and industry production advantages.

Over an extended period, with free mobility of labor and capital and complete knowledge of alternatives, reallocation would take place until an eventual equilibrium was established where no firm or individual would profit by further movement. This equilibrium results in an optimal allocation of resources; all workers being most efficiently employed at maximum wages. The wages under such theoretical conditions are called "equilibrium" wages and serve as standards toward which prevailing wages are likely to progress if continued improvement in resource allocation takes place. Areas where prevailing wages exceed the equilibrium level generally indicate under-utilization of local production advantages requiring further growth to be more productive; areas where the reverse is true likely have excess firms and workers requiring a reduction and relocation for optimal production.

The purpose of this chapter is to define equilibrium wages under pure competition and explain how this condition results in optimal allocation of resources. While neither pure competition or equilibrium conditions are ever fully met, they are of value in indicating the direction in which market forces act to improve resource allocation.

The first section defines equilibrium wages for measurement purposes and presents the formula used for computation drawing upon amenity value measurements reported in Chapter 7. This section should be sufficient for readers not interested in the supporting economic theory. The concepts of pure competition are described in the second section and equilibrium conditions in the third, to furnish both a rationale for measuring geographical wage differentials and a focal point for drawing together the principles of wage theory and amenities. The fourth section shows how equilibrium wages and employment levels are established under conditions approaching pure competition. The last, fifth section, shows the effect of introducing amenities.

Equilibrium Wage Measurement

Economic theory shows that equilibrium under pure competition tends to optimize national productivity and worker and consumer satisfaction. Equilibrium and pure competition seldom actually occur in our economy but they are approached in many situations. Factors preventing their occurrence include workers ignorance of alternative employment opportunities, various ties to communities and current employment which restrict worker mobility, interferences with the price mechanisms such as union negotiated wages, and monopoly in product markets or monopsony in labor markets. These conditions preventing equilibrium, plus the exceptional difficulty of holding necessary occupation, employment conditions, and industry factors constant, makes empirical field estimation of equilibrium wages impossible. As they are a theoretical concept, so also they must be measured by a theoretical definition.

Equilibrium wages can be measured from the conditions which create equal satisfaction for all workers. In equilibrium further movement of capital and labor results in no additional gain. All workers then must be equally satisfied and have no motivation to move. This equal satisfaction can be gained only if all workers are paid equal real wages plus an adjustment for differences in amenities. If workers are paid equilibrium wages, capital also must be in equilibrium since higher or lower wages possible through mis-allocation of capital is not present.

Cost of living measurement to establish equal real wages has already been discussed. Amenity value has been established by adjusted residential site prices. The remaining major problem, initially addressed in Chapter 7 under the subheading "Equilibrium Wages and Amenity Weighting," is determining the weight which should be attached to the amenity adjustment. As explained an estimate can be made based on the relationship of amenity value to real prevailing wages as shown in Figure 9 of Chapter 7. The slope of the indifference curve for a given region suggest the relative value households place on real wages versus location amenities.

The formula for equilibrium wages is:

Equilibrium wages = 1 / Cost of Living - Indifference Curve Slope x (Amenity Index - 100)

Typical slopes of the indifference curves can be determined from the different regions shown in Figure 9. On average a median level value is 1.5, that is a 10 index unit increase in amenities is worth a 15 unit decrease in real prevailing wages. If a unit of prevailing wages is worth $300, then an index unit of amenities is worth $450. This suggests that within regions,

households tend to highly value the amenities of their present location and are reluctant and/or find it difficult to move.

As discussed in Chapter 7, the unique wage-preference curves of households in different regions creates a family of regional indifference curves for the nation. Each curve establishes a regional labor market. Within these markets equilibrium wages can be defined by the formula above, but not so easily between markets. Thus equilibrium wages within the Southwest region can be defined by adjusting the area's prevailing real wage by local amenity values according to the slope of the regional indifference curve. An entirely separate market must be developed for each region using that region's prevailing wages, cost of living, amenity values, and local indifference curve. When each region is in equilibrium, wages throughout the nation will be in equilibrium although a single wage-preference indifference curve is not applicable.

The equilibrium wage differentials of this study report wage adjustments required to compensate workers for differences in satisfaction or utility arising from geographical variations in purchasing power and residence environment. Equilibrium wages for any given city are expressed as an index relative to the U.S. population weighted average equal to 100.

As an example consider city A with a 20 percent greater cost of living than the national average and amenities 40 percent above average (amenities 100 percent above average are considered worth $5,000 yearly). The family budget is $40,000.

In dollar amounts:

Equilibrium wages = real wages + differential value of amenities
= national nominal wage average/CLI +
(national average amenity value x
city amenity deviation from US average)

U.S. average $40,000 = $40,000/1.00 + $5,000(0%)
City Alpha $35,333 = $40,000/1.20 + $5,000(+40%)

In index form:

Equilibrium Wage Index (EWI) = 100/City Cost of Living Index +
Relative amenity value x
(City Amenity Index - US ave AI)

U.S. EWI 100.00 = 100/1.00 + 12.5(1.00-1.00)
City Alpha EWI 88.33 = 100/1.20 + 12.5(1.40-1.00)

Definition and Requirements of Pure Competition[1]

The model on which equilibrium wages is based presupposes market conditions approaching pure competition and partial equilibrium. These conditions have been selected because the supply and demand for labor in many markets may approach these conditions and resources then are close to being optimally allocated. What then, first, is the nature of pure competition?

Pure competition refers to market conditions which allow the prices of goods and resources to move freely. As firms operate under such conditions they move toward positions which maximize their profits and from which there is no incentive to move. Without cost of living, amenity, or production advantage differences, identical workers within an industry are employed at all locations at the same nominal wage. When firms under pure competition reach this equilibrium status, resources are "correctly" allocated, there are no shortages or surpluses, and firm's can make no changes that will improve their profits or reduce loses. All workers are equally satisfied at the same optimal pay level. This correct allocation results in maximum productivity, a much sought economic goal. Thus the value of measures of geographic differentials in equilibrium wages as an indicator of optimal resource allocation.

In common everyday language, "pure competition" denotes intense rivalry among many small equals. Three conditions are required: (1) individual workers and firms cannot influence wages, (2) wages are free to move up or down without restraint of any kind, and (3) a substantial degree of worker mobility exists.

For a firm to operate in a purely competitive labor market, it must employ such a small part of the total supply of any given occupation that its demand will not affect wages. If the firm drops out of the market, total demand for the occupation will not decrease enough to cause wages to drop. If the firm employs all the workers in the occupation it could reasonably want, it cannot increase total demand enough to drive wages up. This market condition exists when many firms individually hire small numbers of workers from a large homogeneous labor pool.

The second condition required is that no artificial restrictions are placed on demands for, supplies of, and wages of labor. Wages must be free to move wherever they will in response

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[1] The presentation is highly selective, concentrating on economic fundamentals without complexity. Throughout the presentations, clarity and brevity has been sought to assist the majority of readers unfamiliar with the terminology and tools of economic analysis.

to changing conditions of demand and supply. There is no coalition among firms. The major control preventing free wage movement in the United States is negotiated wage settlements between management and labor unions. Even then, however, market forces are at work to even out wage differences.[2]

The third requirement necessary for the existence of pure competition in the labor market is worker mobility. Workers must be free to move among alternative uses to firms and locations where they desire employment. They must be able to sell their services wherever they command the highest wage. The amount of actual movement necessary to prevent monopsony (a single buyer of a given occupation) from occurring is usually quite small. The possibility or the likelihood of migration is the important factor. Also, there is at all times considerable change and turnover of the labor force--workers changing jobs, new workers entering the labor force, and old workers retiring. This also constitutes mobility. The primary problem is that of directing the mobility which already exists into economically desirable channels.

The mobility of workers also depends on the time span under consideration. Longer periods of time extend the geographic area within which workers have an opportunity to move. Over a sufficiently long period, say twenty-five years, workers may be fairly mobile within and among many industries throughout large portions of the country. The fact that all firms and workers do not have complete knowledge of existing wage differentials (and working conditions) greatly extends the time required for market action to achieve pure competition and equilibrium.

Even when prices are free to guide resource allocation there are forces which prevent pure competition and correct allocation from occurring. Some monopolistic industries may be able to partially or completely control entry of certain types of workers which prevents their correct allocation. Where some degree of monopsony is present (a singe buyer of a given occupation), correct allocation is prevented. And there are non-price impediments also preventing correct allocation. Workers lack knowledge of higher wages preventing their movement. They also

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[2] Briefly, for it is explained later, the market action is as follows: The productivity of workers at firms paying lower non-union wages exceeds those at firms with higher union negotiated wages. The non-union firms will be inclined to offer higher wages to expand employment and increase profits. New capital will be attracted to the non-union area. These transfers will raise the non-union wages and discourage continuation of the artificially high negotiated wage. Eventually this reallocation will promote a common wage level dictated by the supply and demand of labor under pure competition.

may decline moving due to community ties, family, friends. Accumulated pension and other employment rights may have to be sacrificed in moving. Finally, interference in the free movement of wages may occur, through government control, or more often, negotiated union contract.

Few economists claim that pure competition exists in any important segment of the economy of the United States. However a large measure of competition does exist--not pure competition, but competition containing varying degrees of imperfection. The quest for profits and high wages provides the incentive for efficient employment of resources and efficient production. The fullest measure of efficiency for the whole economy occurs under conditions of pure competition. Thus pure competition shows the direction in which wages tend to move. Further, many firms and workers behave as though they operate in purely competitive markets. Thus encouragement of geographic wage differentials based on pure competition equilibrium, however abstract, works in the direction of greater efficiency in the real world.

Equilibrium "Correctly" Allocates Resources for Maximum Productivity

Movements in the direction of pure competition and market equilibrium, even during short periods of time, improve the efficiency of resource use and therefore are important parts of the "correct" allocation concept. Pure competition establishes market conditions in which commodities, prices, and resources move toward equilibrium and correct allocation.

Human and capital resources are "correctly" allocated when each is most efficiently used. When resources are not correctly allocated, net national product is below its potential maximum. The correct allocation of resources is thus a powerful goal of all economic activity. When resources are not correctly allocated forces are automatically set in motion to reallocate them in such a way that net national product and the efficiency of the economy are increased.

Equilibrium is a state of rest in which there is no incentive to move. Workers are in equilibrium in their highest paying employments with any transfer resulting in lower income. Firms are in equilibrium when it maximizes profits. This concept is important, not because equilibrium is ever in fact attained in our economy, but because they show us the directs in which economic changes proceed. Workers and firms in disequilibrium usually move toward equilibrium positions which at the same time are generally movements toward greater economic efficiency.

Equilibrium confined to a certain economic units, such as an industry, and to the given economic conditions confronting the

unit is called particular or partial equilibrium. Economic disturbances such as strikes, change in consumer preferences, or improvements in production technology, which are not of sufficient magnitude to reach far beyond the confines of a certain industry or sector of the economy are subjects of partial equilibrium analysis. The firm in partial equilibrium is faced with a given product demand situation, a given state of technology, and given resource supply situations. Workers face given alternative employment possibilities and wages. The worker's equilibrium adjustment is made on the basis of the given data.

The equilibrium we are discussing here is also long-run in nature--there is sufficient time for reallocation of fixed resources, that is firms or capital can move from one location to another including entry of new firms. Firms will adjust their scales of plant so as to be as profitable as possible which further leads to optimal resource allocation and consumer satisfaction.

This elaboration on the conditions of partial equilibrium are spelled out so that the reality of their existence and the resulting optimal productivity may be recognized. Many individual firms in the United States operate at similar profit levels with essentially a given demand situation, given technology, and given resource supply, i.e., particular equilibrium conditions. Less frequent but still prevalent are these conditions in industries, particular those sufficiently large, long standing and stable enough to face relatively fixed demand and supply situations.

Wages and Employment of Labor: Pure Competition[3]

This section discusses the setting of wages and employment levels under conditions of pure competition without the complexities of amenities and production advantages to be introduced in Chapter 10. It provides background economic theory for those unfamiliar with such fundamentals.

Wages play a key role in making a free enterprise economy function efficiently. They are important in determining national and individual firm employment levels and they allocate workers among various occupations. Wage differentials serve to reallocate workers among different locations, guiding them away from areas of less productive employment to areas of more

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[3] This theory is general to micro-economic textbooks. Here the discussion has been adapted from several chapters in Richard H. Leftwich The Price System and Resource Allocation, Rinehart & Company, Inc., New York, 1957.

productive use.

Demand and supply analysis serves to analyze the determination of wage and employment levels in a given occupation. The analysis presented here first describes a firm's demand curve for labor and the worker's supply curve, then determines the market price for labor and the firm's employment level. We shall see that as pure competition is approached it is always in the interests of the individual firm to hire workers in a given occupation at the national equilibrium wage.

The Labor Demand Curve for a Single Firm The demand curve of a firm for workers in a given occupation shows the different numbers of workers which the firm will hire at different possible wages. The demand curve equals the firm's value of marginal product curve, i.e., it shows the increase in total production or receipts by the employment of each additional worker per unit of time. In effect, the labor demand curve is a firm's "production function" for labor, i.e., it shows the relationship between hiring more workers and production. It is downward sloping because of the operation of the law of diminishing returns. At the upper left the value of marginal product for labor is high, at the lower right it is low.

The steepness of the demand curve is informative. Capital intensive industries generally have steeper labor demand curves indicating a rapid decline in the contribution of additional workers beyond a necessary minimum. The flatter curves of labor intensive industries show that additional workers continue to be highly productive. Initially hired workers are more valuable than those subsequently employed which accounts for the outward arc of labor demand curves.

The idea of profit maximization by a firm hiring workers according to its demand or value of marginal product curve can be illustrated as follows: If the wage in Figure 10 is w_1, then the firm would maximize profits by hiring q_1 workers. If the firm were to hire q_o workers the q_o worker would add q_o-A to the firm's total cost, but would add q_o-D to the firm's total receipts. It would add A-D to the firm's profits. Additional workers up to q_1 add more to total receipts than to total costs and therefore increase profits. Beyond q_1 additional workers add more to the firm's total cost than to its total receipts and cause profits to decrease. If wages were at w_1, the firm would maximize profits by hiring q_1 workers. At each of the various wages, the firm would maximize profits by hiring that amount of workers at which the value of the marginal product for the additional worker equals the wage level.

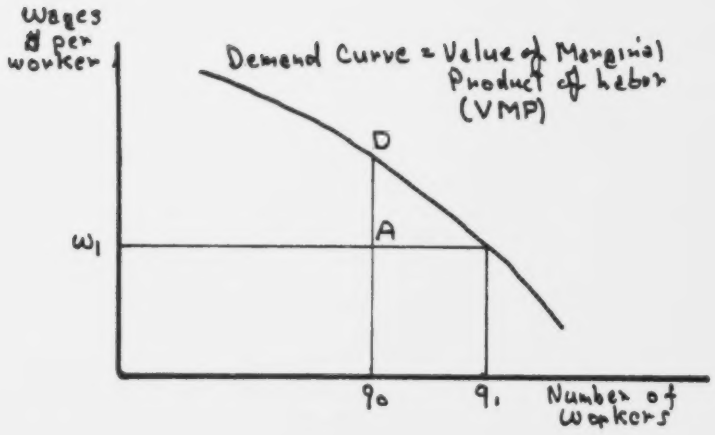

Figure 10

The demand curve for a firm at any one time is based on a fixed amount of capital investment--nonhuman resources such as buildings and machinery. The demand curve for labor thus also shows the marginal product of capital. Movement along the curve represents various ratios of labor to capital. At the upper left the ratio is low and increases as one moves down and to the right. Thus as the ratio of labor to capital increases, labor's value of marginal product and the wage rate decline. At the same time the value of marginal product of capital increases. In opposite fashion, as the ratio of labor to capital declines (moving upward and to the right), labor's value of marginal product and the wage rate increase and the value of marginal product of capital decreases.

Wages and the Level of Employment The firm will employ that number of workers at which the contribution of a single worker to total receipts (shown by the firm's demand curve) equals the contribution of a worker to total costs (shown by the worker's supply curve). This balance maximizes profits.

The market demand curve for a given occupation in a given industry is roughly equal to the horizontal summation of the individual firm worker demand curves. Again it represents the value of marginal product schedule for labor or the amount of workers in a given occupation the industry as a whole is willing to hire at each wage level.

The related market supply curve for the occupation shows the number of such skilled workers willing to be hired at different possible wages by all firms in the industry. Generally

it is upward sloping to the right which indicates that at higher wages more workers are willing to be hired than at lower wages. More will be said about the exact nature of the labor supply curve in the next section. Sufficient here is knowledge of its upward slope.

The market supply and demand curves determine the market price of the occupation in the industry. The equilibrium (a position from which there is no incentive to move) wage will be that at which workers are willing to accept and firms willing to provide. In Figure 11, industry market supply and demand curves are on the right, the individual firm's demand curve is on the left. (The scale of the quantity of workers axis of the market diagram is greatly compressed as compared with that of the single firm.) The occupation's wage will be a w_1. At a higher wage workers will want to sell more than firms will want to employ at that wage. Some unemployment will occur or workers will shift to other industries. The unemployed workers will undercut each other to secure full employment. Thus the wage will be driven down to the equilibrium level of w_1. At wages lower than w_1 there will be a shortage of workers. Firms will bid against each other for the available supply, driving the price up to the equilibrium level.

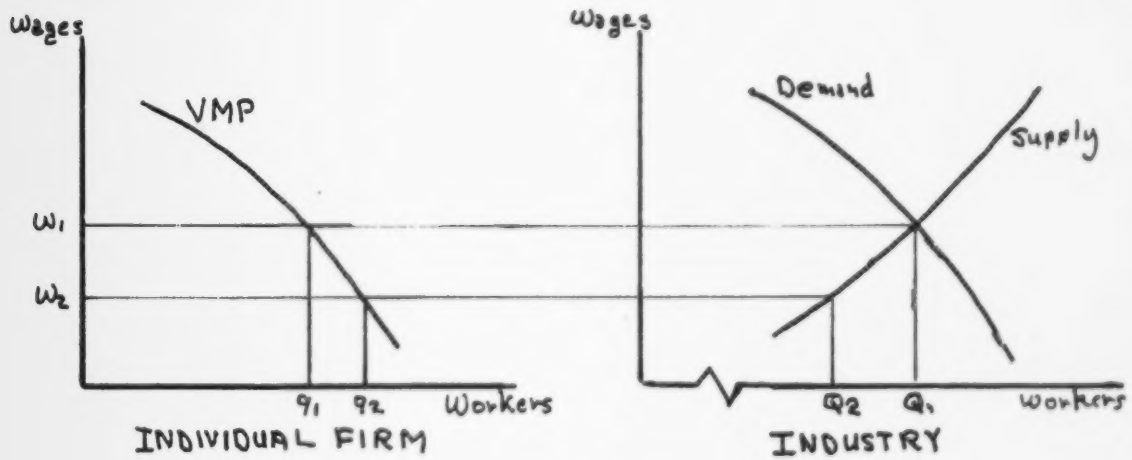

Figure 11

An individual firm in the industry (shown to the left in Figure 11) hiring workers in the occupation can get as many as it wants at the equilibrium wage w_1 and will hire q_1. The single firm cannot influence the wage level. Thus the supply curve of the occupation from a single firm's point of view is shown in Figure 11 as a horizontal line at the equilibrium wage. The wage axis for the firm and industry diagrams are identical. The

industry level of employment of the occupation is the summation of the quantities employed by the individual firms in the industry and is shown as quantity Q_1 in the diagram to the right.

The belief that workers are often paid lower (or higher) than equilibrium wages is widespread enough to warrant consideration of this situation in some detail. Suppose in Figure 11 that the occupation is priced at w_2. At that wage individual firms want q_2 workers in order to maximize their profits with respect to this occupation. All firms cannot get as much as they desire, since the entire quantity placed on the market at that price is Q_2. In fact many or perhaps all firms will each get some quantity even less than q_1. For such firms the value of marginal product of workers in the occupation is substantially greater than the wage. These firms desire to expand employment of the workers in order to increase profits. Each firm believes that by offering a slightly higher wage than w_1 it will be able to get as many workers as it desires. In the absence of collusion among the firms employing the workers--and in pure competition there is no collusion--each attempts the same thing. No firm succeeds in getting as much as it wants until the wage has been drive up to w_1. Under pure competition in worker buying, independent action on the part of each firm and the desire to maximize profits preclude the permanent location of wages below the equilibrium level.

Note also that under pure competition workers in a given occupation receive wages equal to the value of their marginal product. Thus a worker is paid just what he contributes to the value of the industry's product or total receipts. The market demand curve, together with the market supply curve, determines wages; hence the occupations wage is equal to its value of marginal product in any one or in all of the firms within the industry. Any one firm in the industry takes the market wage as given (it has nothing to say about the market level of wages) and adjusts the quantity of workers to be employed in such a way that the value of its marginal product in that firm is equal to the market wage of the occupation involved.

Worker Allocation Under conditions of pure competition the allocation of workers in the national labor market which provides greatest efficiency in their use will be called the "correct" allocation. When workers are not correctly allocated, forces are automatically set in motion to reallocate them in such a way that their efficiency is increased.

Workers are incorrectly allocated among different occupations and industries when their value of their marginal product (the increase in total production or receipts by the employment of an additional worker per unit of time) in one use exceeds their value of marginal product in another or in other uses. Wages furnish the mechanism for reallocation. Firms in

which the value of marginal product for a given occupation is lower are not willing to pay more for it than its value of marginal product. On the other hand, firms in which the value of marginal product for workers is higher can increase profits by expanding the labor force employed. The latter firms bid wages above its level of marginal product in the former firms, and workers, seeking maximum income, transfer from the lower paying to the higher paying firms. As workers transfer, their value of marginal product decreases in the firms in which they are employed and increases in the firms loosing workers. This transfer continues until the marginal product of workers is equalized in all employments, and all firms in the market pay a wage equal to the value of marginal product. At this point workers are correctly allocated, and, within the market, workers make their maximum contribution to net national product.

To illustrate the role of wages in allocating labor, consider the following example of a certain occupation in two different areas (sub-markets). The total supply of the occupation involved is a small proportion of the economy's total supply of all kinds of labor and all workers in the occupation are exactly the same. The products produced in the two sub-markets are essentially the same as are capital facilities and the labor demand curves.

Suppose that Area I and Area II, Figure 12, constitute separate and similar short-period sub-markets initially. The firm's demand curves for labor in the two areas are similar, however labor supplies for the two areas differ. Area I has a larger labor supply than Area II; so the labor supply curve S_1 of Area I lies farther to the right than that of Area II.

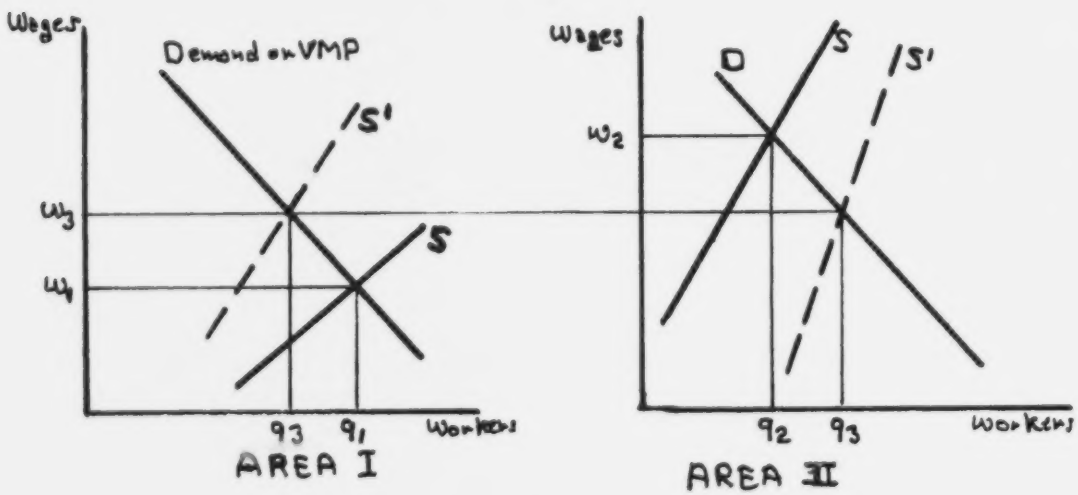

Figure 12

Labor is not well distributed between the two markets initially which creates a difference in wages. The wage rate in Area I will be w_1 and in Area II it will be higher w_2. The level of employment in Area I will be larger q_1 while that in Area II will be smaller q_2. The higher ratio of labor to capital (the level of capital investment is indicated by the demand curve) in Area I causes the value of the marginal product of labor to be lower in that area. The reverse holds in Area II where the value of the marginal product of labor is higher.

The disparate sub-market wages furnish the incentive for long-period movement of workers from Area I to Area II, and this reallocation tends to eliminate the wage differential. As workers leave Area I, the short-period supply curve for that sub-market shifts to the left. As the ratio of labor to capital declines in Area I, labor's value of marginal product to firms and the wage they are willing to pay increase. In Area II the increasing ratio of labor to capital decreases labor's value of marginal product and the wage rate. Reallocation continues until wage rates of the two sub-markets are equal at w_3. The labor supply curves are now S'.

The reallocation of labor between Area I and Area II increases net national product. The initial movement of workers from Area I to Area II causes a loss of w_1 worth of product per worker in Area II and a much greater gain of almost w_2 dollar's worth of product per worker in Area II. Each transfer of a worker from Area I to Area II brings about a net increase in total value of product produced in the economy until the values of marginal product and the wage rate are the same in the two areas. Labor is then correctly allocated between the two areas. No further transfer of labor in either direction can increase net national product, but will decrease it instead. Also, equalization of the wage rates will have removed the incentive for labor migration to occur.

It should be pointed out that the entire burden of adjustment will not be thrown on labor alone in the long period, but will be partly absorbed by reallocation of capital. The differing ratios of labor to capital in the two areas result in different values of the marginal product of capital and returns on investment which furnish the incentive for capital also to migrate between the two areas. The lower value of marginal product causes capita to leave Area II which shifts the demand curve for labor to the left, augmenting the decline in wage rates caused by the increasing labor supply. As capital enters Area I the demand curve for labor increases (shifts to the right). This increase in demand joins the decreases in the supply of labor in raising wages.

Wages With the Introduction of Amenities

AT this point we can introduce location specific amenities of value to households to examine their effect on wage and employment levels. Firms located in unattractive and/or high living cost areas will have to pay a premium for workers to compensate for the area's poor attributes. In attractive areas and/or low cost areas firms will have the advantage of being able to hire workers at less than the average equilibrium rate for the industry. How do firms adjust to this imbalance in wages due to environmental conditions beyond their control?

As we have shown, under equilibrium conditions wages at each firm are equal to the value of the marginal product. Thus in Figure 13, w_e is the equilibrium wage establish by the industry supply and demand curve, S and D in the right hand chart. Any deviations from this wage represents compensation to account for amenities. For the industry, the sum of the adjustments results in no net addition to wage payment, i.e., the sum of all adjusted wages equals the average or equilibrium wage.

Consider two Areas I and II within the same labor market distinguished by environmental factors affecting the cost of living and life quality of workers. In both areas wage contracts are negotiated with firms in the industry by the same union so that workers are equally satisfied or indifferent to the agreed upon combination of wages and living costs/amenities in either area. The products produced by firms in the two areas are the same, capital facilities are the same, and the firms' labor demand curves, D, are the same.

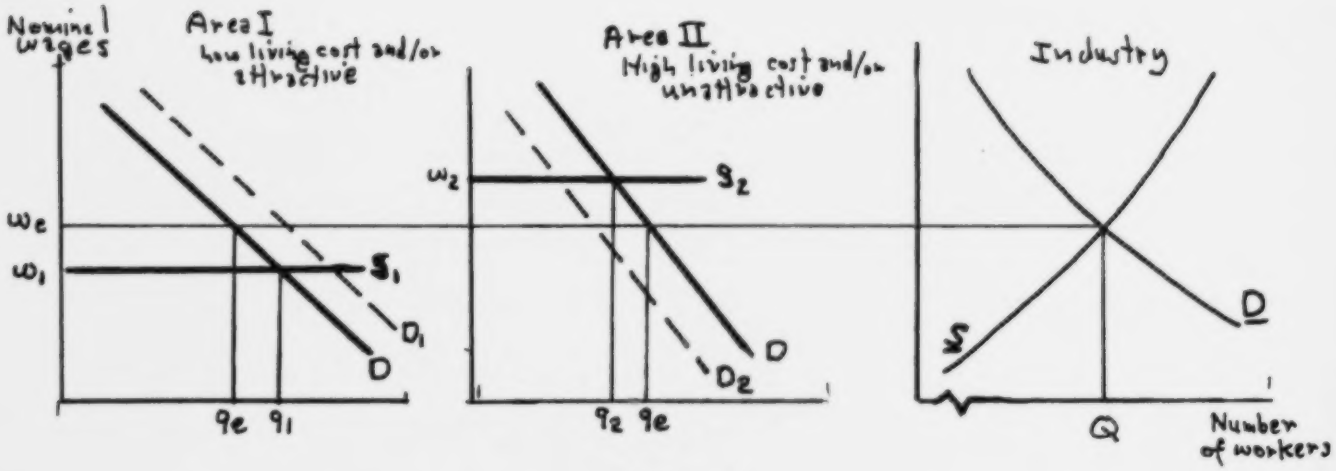

Figure 13

Area II has a combination of high living costs and/or lack of amenities and the workers negotiate added compensation above the equilibrium wage to wage w_2. This wage is the labor supply curve S_2 for unionized firms in Area II. Area I has a combination of low living costs and/or attractive amenities so that the workers are willing to work for a contracted wage w^1, less than the equilibrium level. The w_1 wage is the labor supply curve S_1 for unionized firms in Area I.

Firms in Area II would prefer to hire q_e quantity of labor at the equilibrium wage. However, with the high wage negotiated by the union, they are forced to cut back employment to q_2. In area I the lower negotiated wages w_1 allow firms to hire more workers q_1 than would otherwise be employed at the industry equilibrium wage. Without any compensating production advantages to firms, these wage restraints results in a mal-distribution of labor in the two areas and productivity is less than if the equilibrium wage prevailed.

Area II has a lower ratio of labor to capital (and a higher ratio of capital to labor) than Area I. Consequently we would expect that the marginal physical product of capital in Area II would be lower than in Area I providing incentive for a transfer of capital from II to I. As capital leaves Area II the demand curve shifts to the left to D_2 resulting in fewer workers hired (q_2), but at the same contracted wages. At the union negotiated fixed wages the labor supply curve continues to intersect the demand curve at the same location. Recall that the labor demand curve represents the value of marginal physical product of labor to the firm and also various ratios of labor to capital. At a fixed location on the demand curve the values of the marginal products of labor and capital remain constant as does the ratio of labor to capital. Thus as long at the marginal product of capital in Area I exceeds Area II, there is incentive for firms to transfer capital to Area II and production in the two areas will be below its maximum potential.

The influx of capital into Area I shifts the demand curve to the right to D_1. However the supply curve at fixed wages again intersects the demand curve at the same location so that the labor capital ratio remains the same as do the values of marginal physical products of capital and labor. So long as the union negotiated wage differential between the two areas is maintained, capital will be reallocated from Area II to Area I.

Earlier we have shown that when competitive conditions prevail in the purchase of labor, the equilibrium wage tends to be equal to its value of marginal product, and labor is so allocated that its wage is the same in its alternative employments. Production is maximized. Now we have shown that successful administered wages, adjusted for local cost of living and/or amenities to provide equal worker satisfaction, provides

incentive to transfer capital to the lower wage areas and results in less than optimal production all other factors being equal.

In reality all other conditions are never equals and this continuous transfer of capital does not occur. Every location has different market conditions of advantages or disadvantage to firms in the prices of resources they require. The inequities may arise from superior management of particular firms, favorable locations with respect to markets and sources of labor and raw materials, opportunity for specialized production techniques, and lack of local product competition. Some are offsetting so that firms paying high wages in unattractive or high living cost areas, for example, may have counterbalancing lower costs for energy and transportation. These counterbalancing advantages must exist if firms compete in the same resource and product markets.

Each firm in the industry must struggle to match the marginal physical product/price ratio of each of its employed resources including labor. It can be argued that whatever the initial advantages are, these differentials will not persist because firms will soon recognize such value and price it accordingly. Thus the superior manager can be equally successful and employed with any firm in the industry and his prospective value to other firms becomes his cost to the firm in which he works. The cost of his services to the one firms increases to the point at which he can make pure profits for none, i.e., the value of his marginal physical product relative to his wage is equal to all firms.

The same argument applies to a favorable location with regard to the price of labor and raw materials. The cost of the favorable location becomes its value to other firms which could use it to advantage. Its value to other firms is the capitalized value of the returns it could earn for them. Thus higher yearly loan amortization on attractive industrial lots tend to offset the advantages. Hence the profits locations can provide for any one firm disappear as its cost is correctly determined. However capital and labor are not as mobile as these encouragements might suggest. Many firms need only be mobile within the local markets in which they compete. Firms in larger markets generally do not have complete information on the advantages of other locations, and the costs, including risk, of moving usually outweigh possible gains.

In conclusion we have presented a case in which conditions of pure competition tend to establish an equilibrium wage (for a given occupation) within an industry resulting in optimal allocation of labor and maximum productivity. Under short run conditions firm profits exist and are maximized. Workers, on the other hand, seek compensation for geographical differences in cost of living and residence living conditions or amenities.

Structuring of wages in this manner, while maximizing worker satisfaction, results in some mis-allocation of labor and less than optimal productivity, all other factors being equal. However, the locations of firms within an industry provide various advantages and disadvantages in costs, some offsetting the differences in wages. As a result firms with production advantages are able to pay the higher administrated wages that may be required in their area if it is unattractive to workers. Further, most firms value the stability of their working force provided by negotiated wages which account for amenities. More extensive analysis of the manner in which both household amenities and firm production advantages interact to determine regional and city wage differences is presented in the next chapter.

CHAPTER 10 PREVAILING WAGES AND REGIONAL AMENITIES

Economic theory suggests that under pure competition, equilibrium establishes a common industrial wage for all firms. Yet under market conditions apparently approaching this theoretical position, wage differences are known to exist. This section explains this persistence by introducing an additional critical factor--locational attributes. These attributes are location-amenities favored by household and production economies or advantages to firms. Wage differences persist under conditions approaching pure competition equilibrium because firms in favorable locations are able and willing to pay higher wages, and when production advantages are not present households are willing to accept lower wages for superior living conditions. In equilibrium, the added wages households require in locations they find unattractive are perfectly offset by the production advantages of firms in the area.

Workers and firms act together to establish the prevailing wage at each location. Workers establish labor's supply by their choice of preferred wage-amenity combinations; firms establish the collective demand for labor by their choices of an the most profitable wages and production advantage combinations. The intersection of local supply and demand establishes the real prevailing wage at each location.

This chapter presents a model[1] which explains the effects on wages and employment levels of the introduction of location-specific amenities and production advantages. Included as a household amenity are local cost of living, and included within production advantages are firms' product prices. (This inclusion is a simple means of accounting for geographical price differences.) Other factors which contribute to wage differences, making isolation of the effects of locational attributes alone so difficult, are assumed constant. Thus community differences in such labor force characteristics as age, sex, race, education level, and unionization are fixed. So also is the degree of market disequilibrium in the short run, industry mix of employers, local discrimination, and other conditions of hiring. The locations employed in the model are <u>cities</u> in which households establish a collective supply curve and firms a collective demand curve, <u>regions</u> defined by their

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[1] This model is patterned after those typically employed to explain regional wage and amenity differentials. See "The Economic Roles of Urban Amenities," Douglas B. Diamond, Jr. and George S. Tolley, in <u>The Economics of Urban Amenities</u>; and "Wages, Climate, and the Quality of Life," Irving Hoch with Judith Drake, <u>Journal of Environmental Economics and Management</u>, 1, 268-295 (1974).

household amenities, and areas with distinct production advantages.

The model, shown in Figures 14, 15, and 16, assumes that households within a city have sufficiently similar amenity priorities to identify a composite wage-amenity preference curve representing the city. Similarly, firms within a city are assumed to behave as a group, i.e., constitute a city industry having its own production function, and hiring homogenous labor in a single common market. The collective quantity of workers employed within a city establish the city's population. (We have made the simplifying assumption here that city population size is a constant multiple of employment, i.e, workers per household is fixed.) The model shows how wages and employment levels (population) are set among cities competing in a common market for labor; the market consisting of two regions of differing household amenities, each region having two areas of different advantages in firm productivity.

The horizontal axis of the diagrams reports the total number of workers employed by all firms in an individual city (i.e., a specific city's population). The axis reports the increasing number of workers employed in a single city, not the increasing cumulative population of all cities. As will be discussed, the horizontal axis also measures declining amenities and increasing cost of living within cities as their population increases. The vertical axis reports the common unadjusted nominal wage rate per employee for all workers in the city.

Labor Supply

Consider first the general upward sloping aspects of the labor supply curve or schedule of cities within a given region in Figure 14. The slope shows that at higher wages more people are willing to work. The slope or added wage required by additional workers is called the "reservation" wage differential. But as more workers are hired their grouping in cities introduces city-scale factors which also affect wage demands. Later entering workers require additional wages to cover the combination of higher costs of living and/or lower living conditions as city population (total employment) increases.

The initial downward sloping portion of the supply curve denotes the exceptional desire of early arriving households to live in the area, even to the point of taking reduced wages. Also, small towns may become increasingly attractive as they grow, and even may become more efficient in providing municipal services at lower tax rates.

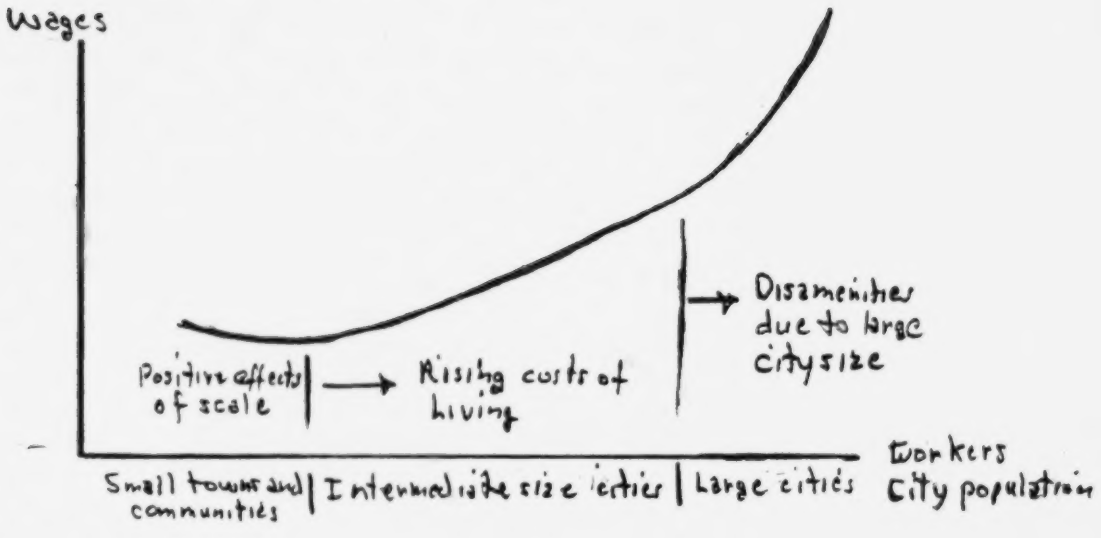

Figure 14.

Larger cities usually have higher costs of living. As cities generate profits they are partially invested in land, and with land at the city centers obviously in fixed supply, site values increase. Population growth creates further demand for land, increasing rents and site prices, and, both directly and by multiplier effects, raise the cost of living. Workers must be paid more to compensate for these higher costs. Differences in living costs then becomes a major factor creating the near linear upward slope of the supply curve for cities of intermediate size.

But as cities grow the concentration of industry, transportation, and consumers, establish scale economies resulting in production advantages to firms and more diversified job opportunities and higher wages to workers. Also larger cities usually have greater cultural and entertainment opportunities. These factors cause the continual expansion of many of our major metropolitan areas.

However population concentration and growth eventually leads to negative results. Large cities usually have greater pollution and congestion, higher crime rates, longer commuting distances, and other negative factors of scale for which workers seek compensation. Of consequence in wage determination is the net deterioration or improvement in living conditions or <u>local amenities</u> resulting from population growth. To simplify our model we assume here that city expansion beyond a certain large population results in a net decline in local conditions. Added compensation for this decline in amenities is the major

contributor to the steeper slope of the labor supply curve of large cities shown to the right in Figure 14.[2]

The increasing steepness indicates that households which find the city most attractive move there first, with the needed (reservation) wage differential rising to attract later arriving less inclined households. The fact that workers continue to be attracted to large cities which in turn continue to grow reflects the importance of the job opportunities available. Cities with minimal negative growth effects have relatively flat supply curves; steep curves indicate a rapid deterioration in living conditions as city population increases.

Thus expanding cities face a conventional upward sloping labor supply curve made steeper by increasingly reluctant workers requiring more compensation for higher costs of living and/or lower living conditions encountered with increased population. Keep in mind that firms will pay these higher wages only if the city location has offsetting production advantages.

Regional Supply Curves

We can now introduce multiple supply curves created by regional differences in general environmental amenities. Assume there are two regions whose labor supply schedules are S_s and S_n as shown in Figure 15. A southern region, subscript s, has superior regional amenities, such as climate, topography, and proximity to recreation areas, relative to the northern region, subscript n. At all city sizes (levels of employment), workers are willing to be paid less in the southern region than the northern region because of these differences in environmental attributes. At the same wage, more workers are willing to employed in the southern than northern region. The supply curve S_s will be below (or to the right of) curve S_n with the vertical difference representing the premium or value placed on the regional amenity differential at any given level of employment. The convergence of the two supply curves means that the value households place on the difference in environmental amenities declines as larger cities in the two regions are compared.

Note that each city in Figures 15 and 16 has its own distinctive supply curve, although the shape and location is generally established by the environmental differences in the two regions. These distinctions are due to intra-city variation in amenities beyond regional differences, such as job opportunities,

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[2] A secondary contributor to the positive wage-city population relationship is the greater division of labor that takes place in the larger more specialized firms in larger cities, and the accompanying higher wage requirements.

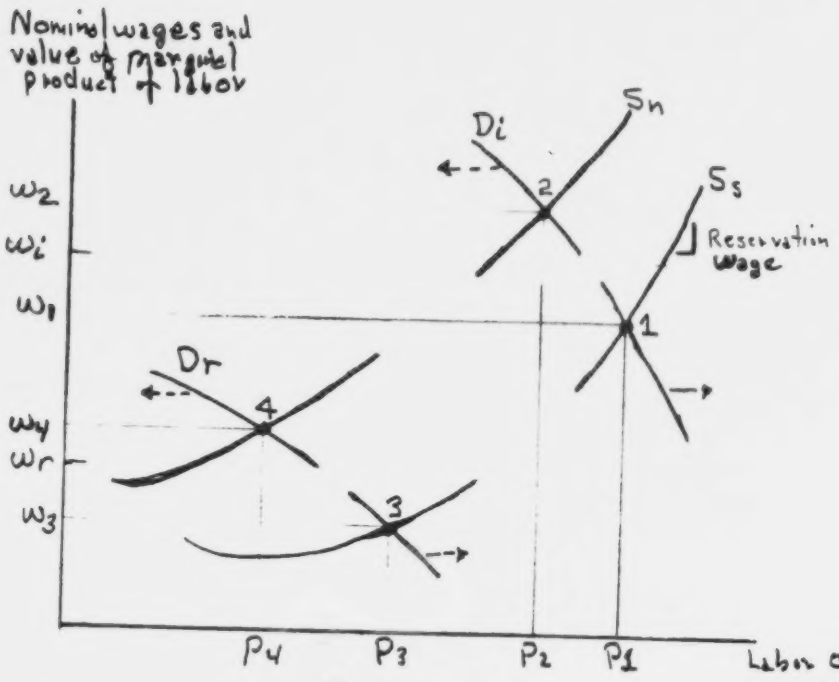

Figure 15

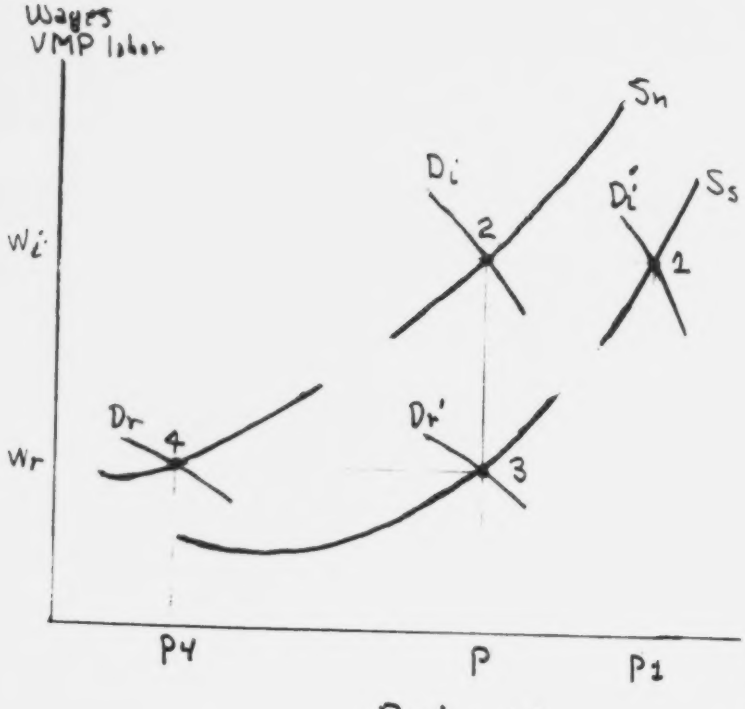

Figure 16

and, as important, the distinct tastes and preferences of each city's residents. Residents in a given city tend to develop a preference for that city's regional and local amenity package. We will see that the implication of this observation is that differences in real wages provide evidence of amenity differential as valued by current residents, not valued by identical workers seeking a optimal wage-location combination.

It is important also to keep in mind that workers are concerned with real wages, that is nominal wages adjusted by cost of living, whereas firms are concerned with the nominal (unadjusted) wage level. In our model we assume that cost of living is proportional to city population. The vertical distance between the curves thus reflects the value of amenity differences between the two regions as evident in a nominal wage differential at that city population level, and, since cost of living for any given employment level (city population) is the same on both curves, evident in real wages at that population as well.[3]

Labor Demand

Next consider the demand for labor. As has been explained, firms will employ additional workers only to the point where the amount added to the firm's total receipts by the last worker hired equals the wages paid all workers. (Previously hired workers add profit to the firm; the last worker's smaller addition to revenues is completely offset by his wage cost.) This production function or value of the marginal product (VMP) of labor constitutes the labor demand curve of firms, or when firms act collectively, cities. The vertical axis of the diagrams thus measures city VMP of labor in addition to worker wages.

The degree to which goods and services are marketed across regions determines the elasticity (relative change in quantity/relative change in price) of the demand curve. Small cities (firms) which trade their products or services across areas and cannot individually influence prices must purchase

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[3] Nominal wage differences between locations exist to the extent that differences in amenity values are not fully capitalized into land values, or, more comprehensively, in higher living costs. If the superior amenities of a given location result in higher land values and exactly equivalent and hence offsetting higher living costs, then equal nominal wages would result in the necessary real wage differential required for workers to be satisfied in both locations. However, conversion of fringe land to urban use usually does not raise living costs proportional to amenity value.

labor at a uniform price set by the industry. More dominate in most cities are firms providing local services; the firms as a group face a downward sloping consumer or product demand curve, and as a city industry their production function or labor demand curve is also downward sloping.

Area Demand Curves Consider next the division of each region into two areas distinguished by their differences in production economies. Firms in the industrial areas, D_i, of both regions have advantages in production versus the disadvantages in the rural areas, D_r (Figure 15). Some of the advantages are exogenous to the presence of firms, such as available natural resources. Most however, are the result of scale effects achieved in the industrial area due to the presence of many other industries and a large consumer market. These economies include ready access to a well-organized capital market, the existence of a large labor market, and the availability of urban infrastructures such as storage, transportation, and power facilities. Access to these advantages need not change the technology of production but it may induce a change in the particular set of inputs chosen for production.

Production economies increase the marginal productivity of labor at each level of employment, raising the labor schedule for cities in the industrial area, D_i, above that for cities in the rural areas, D_r. Cities in the industrial area can thus afford to pay their workers a higher wage at any given level of employment than can firms located in rural areas because of this productivity advantage. The vertical distances between the demand curves represents the additional value of the marginal product of labor between the areas involved due to the production differences. With this knowledge of the labor supply and demand curve for a given city, the basic rule governing geographical differences in wage rates and production advantages affecting firms can be cited as follows: Geographical differences in nominal wages are sustained by offsetting equal locational differences in production economies (adjusted by product price differences if they exist).

The industrial and rural demand curves of Figure 15 will be maintained separate to the extent that the production economies are not capitalized into land prices, i.e., higher land prices counteract production advantages to such an extent that firms must pay equal nominal wages. Again, land prices are not likely to fully reflect locational production advantages because of the immobility of capital. In our model we assume that land prices and cost of living are dependent primarily on city population size, not on differences in regional production economies or household amenities.

The city situation shown in Figure 15 can now be described as follows: City 1, in the industrial area of the southern

region, has both region environment amenities of value to households and production advantages for firms. Its large population results in the highest cost of living and the lowest local amenities. City 2, in the industrial area of the less attractive northern region, has only production advantages. City 3, located in the rural area of the southern region, has region amenities but not production advantages. Finally, city 4, in the rural area of the northern region, has neither advantage and the smallest population. However, city 4 has the lowest cost of living and the highest city amenities.

Equilibrium

Short Run Equilibrium Recall that a city's (firm's) demand for labor is equal to labor's value of marginal product, i.e., how much addition to total receipts is provided by an additional worker. For each city, the initial intersection of the demand and supply of labor, maximizes profits for the firms by equating wages with VMP. This intersection determines the temporary (short-run) wage and the quantity of labor hired, which is analogous here to city population. These intersections for the four cities in our model are shown in Figure 15.

This situation will change as competition and time encourage and allow existing firms and workers to move and new firms and workers to enter the market. Within the industrial area the lower wages in city 1 will attract capital from city 2. A transfer of firms will occur, shifting city 2's demand curve to the left and city 1's curve to the right, until a new equilibrium middle ground common wage W_i is established as shown in Figure 16. Within the rural area the same type of wage difference will encourage firms to move from city 4 to city 3, shifting the city demand curves and eventually establishing a common intermediate wage W_r. In both instances the shape of the demand curves remain essentially the same, they simply shift left or right as a result of an increase or decrease in capital.[4]

Long Run Equilibrium After firms and workers have had time to move within and enter the market, nominal wage differentials will continue to persist, sufficient to compensate workers at each employment level for differences in regional and local amenities and in cost of living. From the point of view of the

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[4] It should be pointed out that the larger population of city 1 will likely provide positive advantages of scale which slightly raises that cities demand curve, D_i'. City 3 with a larger population has the same production scale advantage over city 4, and consequently a slightly higher demand curve, D_r'.

firm, the wage differences deflated by the product price,[5] compensate for differentials in the value of marginal product of labor due to locational production advantages. At equilibrium, city size is set so that the demand and supply curve intersection provides production advantages to firms equal and hence offsetting to any additional wages required for amenity and living cost differences.

Consider the resulting equilibrium situations in the four cities as shown in Figure 16. The location of city 1 in both an attractive southern and productive industrial area allows it to hire the most workers at a high nominal wage. With the largest population, city 1 has the lowest local amenities and highest cost of living. City 4's unattractive northern rural location without production advantages accounts for its small population and low wages. Offsetting are high local amenities and low cost of living. City 2 because of its production advantage (offset by high wages) and city 3 because of its climate (allowing low wages) have the same population, cost of living, and local amenities.

How are these differences in nominal wages and employment levels maintained in equilibrium? Firms in cities 1 and 2 (as in cities 3 and 4) pay the same nominal wages and have the same production advantages (disadvantages). Therefore the firms are in equilibrium. The difference in real wages between the two cities fully compensates the different number of workers willing to be employed so there is no incentive for workers to move. (The high living costs and lower local amenities of city 1 are offset for workers by that city's southern regional amenity superiority; the opposite for city 2 where a lower cost of living and superior local amenities offset the northern region's inferiority.) Thus the intersections of supply and demand in cities 1 and 2 (and cities 3 and 4) are in equilibrium.

City 2 must pay wage W_i, higher than the W_r wage paid by city 3 by an amount equal to the value of the regional amenity differential. However, this wage differential is exactly made up by the production advantage industrial city 2 holds over rural city 3. (This equivalency can be seen by the fact that when both cities employ the same number of workers, the distance between the demand and supply curves representing both measures is the same.) Cities 2 and 3 are thus in equilibrium and hence all four cities are in equilibrium.

The nominal wage differential between cities 2 and 4 (also 1 and 3) is the reservation wage requirement between the two sized

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[5] Competing for the consumer's dollar, locally traded products and especially services are usually priced proportional to their cost, i.e., local wage levels.

cities. The population growth of city 2 is restricted by increasing costs of living and declining local amenities. The population decline of city 4 ends when the few remaining citizens value the lower real wages but superior local amenities equal to the package of city 2. Capital is not transferred from high wage city 2 to low wage city 4 because firms would lose the productivity advantage of the industrial area.

Rules for the Relationship Between Amenities and Wages

Four combinations of regional and city local amenities, firm production advantages, employment level (city size), and cost of living are presented in the city situations in Figure 16. What rules govern the relationships can be stated in sufficiently general terms to be broadly applicable to cities in the United States?

(1) Cities in different amenity regions, within areas of generally equivalent firm productivity, tend to vary in size so as to compete at similar nominal wages. Amenity differences among cities are evident in population and cost of living; larger cities in attractive regions having offsetting higher living costs and poorer local amenities than smaller cities in less attractive regions.

(2) Within regions of given environmental amenities, cities will hire workers at wages proportional to the area's production advantage, with higher nominal wages offset by equal production advantages (and likely higher product prices). The poorer local amenities and higher living costs of large cities will offset these nominal wages differences so that workers will have no incentive to move within the region.

(3) Cities located in areas of different firm productive advantages and regional amenities tend to hire workers at nominal wages such that the differentials exactly compensate or penalizing firms for the production disadvantages or advantages held. For cities of similar size and cost of living, nominal wage differences tend to compensate for regional amenity differences. For cities of unequal size and cost of living, a combination of real wage and local amenities will satisfy workers in different regions.

As a general rule for all combinations, the differential value of regional and local amenities reflected by real wage differences, will tend in every location to equal the production advantages or disadvantages to firms reflected by differences in the value of marginal productivity (VMP) of labor adjusted by relative product price.

Real Wage Amenity Differences Equal It can be seen from Figure 16 and the forgoing discussion that nominal wage differentials reflect amenities differences only when the full value of such amenities is capitalized in cost of living. However, also evident from our model, differences in real wages, provided there are no interferences in market pricing, tend to reflect differences in the value workers place on amenities. This relationship occurs because real wages take into account cost of living, and any remaining wage difference can, under conditions of pure competition, be attributable only to value differentials arising from amenities.[6]

Reallocation Due to Changing Regional Conditions

Consider how resources might be reallocated if there were a decline in the relative production advantages of areas or a change in the value households place on regional amenities. Note first that workers have no incentive to move as long as the relative value of regional amenities remains fixed. Capital migration is thus the most likely reallocation to occur. If the industrial area gradually lost its production advantage, firms in city 1 would move to rural city 3 in order to pay lower wages (Figure 16). These capital shifts would result in increased hiring in city 3 until both cities employed an equal number of workers at a new equilibrium intermediate wage. The same reallocation would occur between cities 2 and 4 reaching the same equilibrium wage. A greater number of workers would continue to be employed in cities 1 and 3 because of their superior local amenities.

A more remote but still real possibility is a change over time in the relative value households place on regional amenities. Suppose over a number of years workers began to place less value on the south/north amenity ratio. To simplify the situation, assume the decline is reflected in a shift to the left of the S_s supply curve (Figure 16). Intersection with the demand curves in cities 1 and 3 would then occur at higher wages. Firms seeking lower wages would transfer in their respective areas to

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[6] Our model assumes that city cost of living and local amenities are directly proportional to workers employed or city population. The difference in amenity value for cities 1 and 2, at equal nominal wages W_i occurs because of the offsetting higher living costs in city 1 resulting in a real wage differential exactly equal to the amenity difference. However, such uniformity between population and cost of living does not exist, yet other factors such as variance in worker tastes and preferences combined to reallocate workers such that remaining differences in real wages reflect variations in the value of amenities.

cities 2 and 4, shifting the two demand curves together to eventually establish new equilibrium intermediate wages (slightly higher than W_i and W_r respectively). If this change in household preferences continued, cities 1 and 2 would eventually employ an equal number of workers; also cities 3 and 4. Cities 1 and 2 would continue to have a larger population because of their production advantage.

If both amenity and production advantage differentials disappeared, a uniform equilibrium nominal wage would prevail in all four cities, about the same number of workers would be employed in each city with the same cost of living, and there would be no incentive for either workers or firms to move. This condition, without locational attributes, is the equilibrium under pure competition discussed in Chapter 9.

Supply and Demand Curves on a National Scale

Instead of only two demand and two supply curves, a multitude of environmental amenity and production advantage differences exist throughout the United States, creating a family of literally dozen of regional demand and supply curves and hundreds of more specific city schedules within regions. Each city's supply and demand curve has a slightly different slope and shape but all employment levels, i.e. city populations, are determined by their intersection (see Figure 9, Chapter 7). A given labor market may consist of one or more similar regions in which households have similar wage-amenity preferences and workers are generally mobile. Within these markets higher wages compensate for lower amenities and are offset by production advantages. Lower wages reflect superior amenities and are offset by production advantages. However, the absolute levels of wages and amenities cannot be compared across these labor markets because different sets of amenities and preferences and their value are involved.

Recall that the model addresses only a given occupation within a single industry. The supply curves of the various families of occupations have their own peculiarities including different reactions to regional and city amenities. Industries have different demand schedules for various occupational groupings and do not uniformly benefit from specific locational production advantages. Thus, the intersection of supply and demand is a function of occupation, industry, and the equivalent value of location amenities to households and production advantages to firms as indicated by real wages. Therefore in order to measure amenity differences by analysis of real wages it is necessary to control at least industry, occupation, and cost of living.

PART IV. COST OF PUBLIC SERVICES

Chapter 11. COST OF GOVERNMENT SERVICES INDEX

This chapter presents a Cost of Government Services Index (COGS) which reports the relative prices state and local governments must pay for a fixed basket of the goods and contracted services they purchase to provide public services to residents. The estimated price range is from 89 (Mississippi) to 127 (Alaska). Cost variations of this magnitude can make it very difficult to administer Federal grant programs to states equitably. Within states a lessor price range still imposes an imbalance in real resource allocation when distribution is strictly in terms of equal nominal dollars. Although there is no consensus of what constitutes "equity," adjustment for geographical price differences would substantially help to achieve a more nearly equivalent level in real resources available for public programs and benefits.

The Politics of Cost Adjustment

The case for such geographical cost adjustment is solid and has long been advocated by scholars including Selma Mushkin, Stephen Barro, Friedrich Grasberger, and Jay Chambers. The chief drawbacks have been the inability to demonstrate conclusively the validity of the indexes proposed, and the reluctance of some legislators to alter the balance of grants now tending to favor the poorer areas of the country.

Low prices and poverty with a high incident of need are often found together. Without price adjustment, these poor areas receive proportionally more assistance than if a price adjustment were imposed. However, low cost and poverty are not perfectly correlated. The poverty of central cities in the northeast for example, is often accompanied by high local prices. Price adjustment would benefit these inner city poor communities.

In the final analysis, equity is most served by accurate measurement of needs, wherever found, and price adjustment to provide equal real resources per unit of need. More important than the measurement of relative prices is accurate measurement of complete needs. In poor districts the indirect ramifications of poverty and the total cost requirements of transition to productive citizenship are often not fully taken into account. This often leads to an understatement of public service needs in poor neighborhoods relative to the possibly less complex requirements of more affluent areas. Unadjusted funding tends to ameliorate this under-counting of needs.

A second consideration in judging the value of introducing geographical price adjustment is the contention that it interferes with market action. The argument in theory runs as

follows: Geographical differences in wages, the price of services, and returns on investment encourage the movement of workers, consumers, and firms to areas of greatest value. Unadjusted cash assistance payments create greater purchasing power for recipients in low cost areas, an incentive for people to migrate there. Similarly, fixed rate subsidies to businesses creates a competitive advantage in low-cost areas and stimulates migration. Over time this migration expands and improves the economy of these areas, resulting in more rapid growth than if such incentives were not involved. Since most low cost areas are also poorer, poverty is thus abated through stimulating growth by what, in effect, amounts to a government subsidy. As the growth takes place, accompanying price increases (relative to other areas) automatically reduce the subsidy.

Actually, adjusting dollars for equal purchasing power represents market action reality--non-adjustment, in providing an artificial (although possibly well intended) subsidy, represents interference. This interference presents some risks to efficient resource allocation. The excess government allocations create an attraction to workers and firms to migrate which is not initially supported by the immediate market. Should growth and price increases occur, use of unadjusted funding as a temporary catalyst is likely justifiable. However, if conditions prevent new firms and workers from achieving competitive status, a permanent subsidy may be required. Thus, where the potential for growth is poor, the use of unadjusted aid may develop an artificial dependent economy.

There is a much more compelling point to be made favoring price adjustment. There is a substantial penalty--current inequities and human deprivation--in continuing unadjusted dollar subsidy. Those in need in high price areas receive proportionally less aid than those with equal need in low price areas. No argument in favor of potential long term growth can justify inequitable treatment of immediate need realities. Equal needs warrant equal resources. If dollars do not buy equal resources, citizens are not equally treated. The pressing public service needs of their constituents and knowledge of the basic inequities which result from fixed amount allocations should be persuasive to legislators in favor of price adjusted funding.

Cost of Government Services Index and Application

Cost of Government Services Indexes are reported in Table 1 for 579 cities and state averages. The indexes report geographical relative prices for major items representative of a fixed basket of goods and services state and local governments typically purchase for current operations of human service programs. COGS is based on a Metropolitan Statistical Area and county population weighted U.S. average equal to 100.

COGS is applicable for adjusting state and/or local government financial data to obtain equivalent purchasing power for a fixed market basket, provided the expenditures (or revenues used for such expenditures) being priced are consistent with those of the index. This means that first, the Cost of Government Services Index may be applied only to government current operations budgets for public human services--education, police and fire protection, welfare, and related administration, exclusive of direct assistance and subsidies to individuals. Health services, because of the exceptional pattern of medical salaries in the country are excluded. Capital investment, equipment expenditures, and interest payments also are not priced by the Cost of Government Services Index.

Second, the specific expenditure package being adjusted, must pertain to a budget similar to the type, quality, and distribution of items priced by the index. The jurisdiction's staffing pattern, in particular, must be consistent with the national norms used for the index (see footnote 2, Table B-1, Appendix B).[1] The index does not, for example, equate purchasing power among states with a greater proportion of professional workers than cited.[2]

Third, the governments involved must compete in the market for goods and services of the standard quality level priced, paying typical prices established by local supply and demand. COGS does not establish equivalency for qualities or items other than those described, nor does it account for over-payment through faulty price negotiation.

Since COGS is based on a composite state and local government current service budget, it is most applicable to state level aggregate current revenue and expenditure data. (The budget is developed in Appendix B.) COGS is thus most applicable to state-level school, higher education, and police and fire protection budgets. However, COGS is not applicable to budgets in greater detail, e.g., "instruction" in elementary-secondary schools, where expenditures do not follow the weighting pattern employed.

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[1] The Cost of Government Services Index employs only a single prevailing wage to establish the geographical wage differentials for all occupations employed by governments. This restriction imparts a uniform error for all jurisdictions provided they have similar staffing patterns.

[2] Because the geographical price differentials for many items are similar, small budget weight variations have little effect on overall index values. COGS can usually be applied to most jurisdictional public service budgets provided the budgets pertain to exactly the same functions in each instance.

Example Applications of COGS

The procedure for adjusting expenditures for equivalent purchasing power using the COGS index is illustrated in the following application:

The task is to allocate $100 million in federal aid among three states so that each receives equal purchasing power per unit of need. Additional input data are state counts of needy (user) units and state COGS indexes.

State	Needy units	COGS	Adjusted $ amounts allocated per needy unit	total
A	100,000	100	$161.29	$16,129,032
B	200,000	80	$129.03	$25,806,452
C	300,000	120	$193.55	$58,064,516
Total	600,000			$100,000,000

The formula used to derive state COGS adjusted allocations is based on the total federal funding equaling the sum of the state allocations with unit amounts proportional to COGS index values, i.e., in the ratio of 100:80:120.

100,000(1.00 Y) + 200,000(.80 Y) + 300,000(1.20 Y) = $100,000,000
Y = $161.29/needy unit.

Three examples presented in Table H show the effects of applying COGS to state-level fiscal data. The index is first applied to state and local government tax revenues per capita, which represent collected tax wealth relative to resident count as a rough measure of available resources per unit of public service need. In the second instance, the finances adjusted are current school expenditures per pupil in average daily attendance, which report the resources made available by state and local governments to support their public elementary-secondary school systems. The third application involves education appropriations per annual FTE student, which reports state and local government funding for current operations of public colleges and universities less support for research, agriculture, and hospitals and medical schools.

Because some states with high COGS values also have very large populations, only 11 states have COGS values greater than 104. For these states, adjustment by COGS results in lower dollar amounts of equivalent purchasing power. Eighteen states have COGS' between 96 and 104 with adjustment resulting in relatively minor changes in dollar amounts. For the 22 states with COGS' less than 96, adjustment results in significantly higher dollar amounts. Note that when states are tightly grouped, small changes in amounts can result in substantial but relatively meaningless changes in rankings. Rankings thus often convey less meaning of relative position than does indexing.

Table H
Application of the Cost of Public Services Index to State Tax Revenues, School Expenditures, and Appropriations for Public Higher Education

State	Cost of Public Services Index CPS	Tax Revenues per Capita, 1983-84					Estimated Current Expenditures for Public Elementary-Secondary Schools per Pupil in Average Daily Attendance, 1985-86					State and Local Appropriations for Current Operating Education Expenses of Public Institutions per Annual FTE Student, 1985-86				
		Amount	Index	Rank	Adjusted by CPS Index	Rank	Amount	Index	Rank	Adjusted by CPS Index	Rank	Amount	Index	Rank	Adjusted by CPS Index	Rank
ALABAMA	94	$918	88	(48)	72	(47)	$2,729	73	(48)	78	(44)	$4,055	107	(13)	114	(10)
ALASKA																
ARIZONA																
ARKANSAS																
CALIFORNIA																
COLORADO																
CONNECTICUT																
DELAWARE																
DIST COLUMBIA																
FLORIDA																
GEORGIA																
HAWAII																
IDAHO																
ILLINOIS																
INDIANA																
IOWA																
KANSAS																
KENTUCKY																
LOUISIANA																
MAINE																
MARYLAND																
MASSACHUSETTS																
MICHIGAN																
MINNESOTA																
MISSISSIPPI																
MISSOURI																
MONTANA																
NEBRASKA																
NEVADA																
NEW HAMPSHIRE																
NEW JERSEY																
NEW MEXICO																
NEW YORK																
NORTH CAROLINA																
NORTH DAKOTA																
OHIO																
OKLAHOMA																
OREGON																
PENNSYLVANIA																
RHODE ISLAND																
SOUTH CAROLINA																
SOUTH DAKOTA																
TENNESSEE																
TEXAS																
UTAH																
VERMONT																
VIRGINIA																
WASHINGTON																
WEST VIRGINIA																
WISCONSIN																
WYOMING																

Sources: Tax Revenues—Governmental Finances in 1983-84, U.S. Department of Commerce, Bureau of the Census.
School Expenditures—Estimates of School Statistics, 1985-86, National Education Association. (Data updated slightly.)
Appropriations for Higher Education—State Profiles: Financing Public Higher Education, 1985-86, Research Associates of Washington.

COGS Index Parameters

Because of keen interest in the fair distribution of funds to public schools, the principle work in developing geographic cost adjustment factors has focused on district level school finance.[3] Despite the soundness of this research, only a few states--Florida and Alaska among them--are using the findings and only in a limited way. Both states distribute state aid to local school districts by adjusting for differences in consumer prices. Such a cost-of-living adjustment reflects differences in salaries paid to teachers to maintain their equal purchasing power, but it does not accurately reflect differences in the cost of the total education package purchased by district governments.[4] What has been needed for some time is an accurate measure of the relative cost to governments in providing a fixed level of government services.

There has been useful exploratory work at the state level to develop government geographic cost adjustment factors.[5] This work has clearly substantiated the presence of inter-state cost variations. However, these indexes have been used primarily to illustrate procedure and data deficiencies, and are not suitable for practical application. The works at both the district and state levels make it clear that federal grant monies and state and local government revenues should be adjusted for geographical

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[3] See, for example, Alvin S. Rosenthal, Jay H. Moskowitz, and Stephen M. Barro, Developing a Maryland Cost of Education Index, AUI Policy Research, Washington, D.C., 1981.
For an excellent summary of the state of the art and bibliography, see Jay G. Chambers, Cost and Price Level Adjustments to State Aid for Education: A Theoretical and Empirical Review, Stanford Education Policy Institute, School of Education, Stanford University, Stanford, California, 1981.

[4] See Jay G. Chambers, William T. Hartman, and Phillip E. Vincent, Florida's Price of Living Index and Alternative Cost of Education Adjustments: A Framework and Evaluation, Report No. 2, SRI International, Florida Department of Education, 1980.

[5] Most noteworthy is the work done at the Center for Governmental Research, Inc., under the direction of Friedrich J. Grasberger. Using data recognized as severely limited (salary data without holding occupation mix and quality constant), the study never-the-less ably illustrates the feasibility of the market basket approach to index construction, and, more important, "...demonstrates the potential effects of adjusting Federal grants-in-aid for the geographic variations in the cost of government." See Melinda G. Meyer, Cost of State and Local Government Indexes, A Working Paper, Center for Governmental Research, Inc., Rochester, New York, 1978.

price differences. However, there are some objections centering more on political sensitivity than the desire for equitable funding. The issues of equity and cost adjustment were discussed briefly in the first section of this chapter.

In general, a geographical cost index measures the relative price that a given type of jurisdiction in various locations would negotiate or be required to pay for a standard "market basket" of goods and services of fixed quality, purchased for a specific function or set of activities. Only the component of price variation that is beyond local control is measured. The index itself is the ratio of local prices and wages to national average values.

The jurisdictions in this instance are the city and other local governments associated with the 579 MSA and urban areas reported, and the 50 state combined state-local governments and the District of Columbia. The activities, whose purchased goods and services are to be priced, are the current operations of the principal public human services of state and local governments, i.e., education, police and fire protection, welfare administration, and related state and city-county level support functions. It is believed that the geographic cost differentials developed, uniformly apply to these labor intensive government activities. The special material and energy requirements of capitol intensive public services, however, such as highways, utilities, and sewerage and sanitation, prevent their inclusion, as does the special wage structure present in the health fields.

The standard "market basket" is an estimated national average budget of the goods and services purchased by state and local governments to operate public services; excluding direct assistance and subsidies to individuals. (The relative purchasing power of subsidies to individuals is established by the Cost of Living Index.) The budget is simplified to four markets for which prices in the geographic detail required are available--labor, consumer type goods, energy, and nationally priced items. These categories are representative of all the items purchased. Development of the budget is presented in Appendix B.

The Cost of Government Services Index is defined as a relative measure of the typical negotiated market prices that state and local governments pay for a standard market basket of goods and services of fixed quality specifications purchased annually for the current operations of their collective public human services, excluding public health and direct assistance and subsidy outlays. Use of COGS must be limited to revenues or expenditures directly related to the current operations of these labor intensive public services, excluding funds for interest, capital investment, equipment expenditures, and direct aid or subsidies to the public. The type of budget for which the COGS

is applicable is illustrated in Table B-2, Appendix B.

The COGS city indexes are based on a city population weighted U.S. average equal to 100. The state COGS indexes equal a population weighted average of the cities within the state. The state indexes are then automatically based on a state population weighted U.S. average equal to 100. Note that the relative values of city and state indexes remains the same regardless of the weighting scheme employed. Note also that the price structure of rural areas is excluded.

Government jurisdictions differ in the importance they attach to various public services and in their capacity to support such services. Thus the quality of worker services purchased varies, e.g., one jurisdiction may require that secondary school teachers have a masters degree and 5 years experience, another a bachelor degree and no experience. For this reason alone, actual wages paid cannot be used for index construction.

Assuming quality is held constant, other factors controlled by the jurisdiction also influence wage levels. Wealthy states are susceptible to paying more than necessary for a given quality because of their over-payment history and recognized affluence at the bargaining table. Further financially strong states may pay government employees more in the expectation of higher standards whether realized or not. Poor states, on the other hand, may be forced to pay less than a reasonable minimum wage and still, in a depressed market, secure fully qualified personnel.

If they are the sole purchaser (monopsony), governments may also temporarily influence prices, for example, in being the near exclusive employer of school teachers and law enforcement officers. Finally, although more a factor in the purchase of goods than labor, large states may receive discounts by buying in utilities and equipment in quantity (economies of scale). Variation among jurisdictions in these factors, particularly state tax wealth, again restricts use of actual prices paid as inputs for index construction--these variations in addition to the aforementioned critical employee quality differences.

Prices Used for the Cost of Government Services Index

State and local governments purchase goods and services in five markets, which are believed sufficiently distinctive to warrant separate price series for the type of aggregate cost of government services index proposed, are: labor, 79 percent; contracted services, 5 percent; energy, 5 percent; consumer goods, 9 percent; and national goods and services, 2 percent. This budget composition and weights is derived in Appendix B. Because of the unavailability of distinct contracted service

prices and the likely resemblance to price behavior for labor in general, this category is collapsed into a single labor category with the resulting final four price markets--labor, 84 percent; consumer, 9 percent; energy, 5 percent; and national, 2 percent. Obviously the labor market is the primary determinant of the overall price differences facing governments.

The labor market establishes the geographical wage differentials for government employees. The desired price series here are mean prevailing wages in the competitive market for those occupations employed by state and local governments. As a proxy, the price series used is the estimated prevailing wages for typical occupations in retail trade and service type industries presented in Chapter 8.

Separate prevailing wage series for the major occupations employed by governments is not currently possible. However the error introduced by this lack of refinement may not be too serious. Amenity-wage preferences are more likely set by personal tastes than by an individual's occupation. However, firm may have substantially different offer curves for the various occupations. Without documentation the differences involved are not known. This study presents the supply-demand market workings for one set of occupations and the resulting geographical wage differentials may, in fact, be highly representative of much of the employed labor force.

To illustrate, if the geographical service occupation wage differential employed as a proxy for all government employees indicates a 1.4 geographical ratio between Alaska and Mississippi, the ratio is likely to be similar for many other occupations, and the higher ratios for some occupations will be counter-balanced by the lower ratios for others, so that the true mean for all government occupations may be very close to the 1.4 mean difference employed. This rationale is the only support offered in justifying the adequacy of data used.

There is also a near insurmountable practical obstacle. Collection of geographically representative prevailing wage data, by even the crudest occupational classifications, would require a massive effort, far beyond the known current plans of any federal agency. Further such data, if possible to refine, would require definitions in such detail as to impose an extreme burden on reporting firms. Prevailing wages by occupation, industry, and location are more a concept than a measurable reality. Together, both the expected adequacy of using a single proxy prevailing wage, and the complete absence of more detailed wage alternatives, justifies its use here in developing geographical comparisons of government public service costs.

The contracted services market prices professional, technical, and skilled services such as consultants, engineers,

data processing personnel, repair persons, security, maintenance and yard personnel, craftsmen, laborers, etc., contracted--not permanently employed--by state and local governments. Telephone, rent, insurance, water and sewerage, personnel training, medical services, local transportation, are the types of services governments may contract. No specialized price series is available. Since the services involved are labor intensive, it is assumed that prevailing wages used for the labor market above are applicable.

The consumer market prices the goods purchased locally by state and local governments. The items consist mostly of consumable supplies and materials for the office, classroom, laboratory, health units, and building and ground maintenance; food; and small, inexpensive equipment items not carried or depreciated as property. (Recall that COGS prices only public human service operations so that materials for buildings and roads are excluded.) These mostly consumable supplies are likely to be purchased by jurisdictions in large quantities at wholesale prices. Also, some locations may have offsetting price advantage and disadvantages for some items. However, other than these generalities little information is available on the quantities and prices of the specific goods involved.

It is assumed here that the price differentials involved parallel that of the family consumption items priced for the Cost of Living Index. These prices are used for pricing the consumer market component of the Cost of Government Services Index. To the extent that the actual price differences paid by governments are less than for family consumption, use of this component of the CLI to estimate prices in this market results in slight over-pricing in high cost areas, and under-pricing in low cost areas.

The national market includes the goods and services having no significant price differentials. This rarity occurs because there is a single or only a few supplies for certain high cost items or because patents and copyrights have created a monopoly or oligopoly product market. Fairly uniform prices also occur in highly competitive industries with low product transportation costs. Items and services which exhibit some uniformity in pricing include telephone service, computer software and hardware, text and library books, camera film, etc.

The energy market is more complex than simple comparison of prices. Both prices and the type of fuel used locally, heating and cooling needs, and efficiency of conversion, all need to be taken into account. Thus the "price" involved is actually a yearly expenditure amount. Although pricing energy for government expenditure should employ commercial rates and perhaps other revision, ACCRA data for heating and cooling yearly costs for residences (including other electrical usage, telephone, and sewerage) has been used as the only available approximation.

These ACCRA utility prices have previously been discussed in Chapter II.

APPENDICES

APPENDIX A: REGRESSION ANALYSIS TO PREDICT CONSUMPTION & HOME OWNERSHIP COSTS

Compilation of the Cost of Living Indexes (CLI) of this study has been outlined in five steps:

1. Compile indexes of Consumption costs using the American Chamber of Commerce Research Association (ACCRA) data set.
2. Compile indexes of Home Ownership costs using Housing and Urban Development (HUD) site prices and Dodge Construction Costs data sets.
3. Compile weighted average of Consumption and Home Ownership costs (C&H) for the core universe.
4. Predict C&H costs for city groups #2, #3, and #4 based on regression analysis of the core universe.
5. Compile Cost of Living Indexes for all locations as a budgeted weighted average of C&H costs, individual income taxes, and price neutral deferred benefits.

These steps are discussed fully in Chapter 5. This appendix presents the regression analysis detail of STEP 4.

Regression of the core universe (city group #1), for which all data are available, is performed to determine the predictive equations of Consumption and Home Ownership (C&H) costs for the three other city group locations for which complete data are not available. The independent variables are: Home Ownership costs, Consumption costs, and Dodge Construction Costs. Organization of the data and results of the regression analysis are shown in Table F, reproduced from Chapter 5, on the following page.

For city group #2, approximately 60 cities, C&H costs are predicted using an estimation equation with Dodge Construction Costs and Consumption costs as two independent variables. For city group #3, approximately 90 cities, C&H costs were predicted using an estimation equation with Home Ownerships costs as a single independent variable. For city group #4, approximately 280 cities, C&H costs were predicted using and estimation equation with Dodge Construction Costs alone as the independent variable.

The appendix tables present the following elements of the regression of the core universe (150 observations): Table A-1, "Statistics of Distribution," reports mean, standard deviation, and minimum and maximum values for the four variables--C&H, Home Ownership, Consumption, and Dodge Construction. Table A-2, "Correlation Matrix," reports correlation values for the four variables. Tables A-3, A-4, and A-5, "Regression Analysis, City Group #_," report the regression analyses for city groups #2, #3, and #4 respectively.

The correlation matrix can be used to determine the degree to which each of the components independently contribute to C&H cost values for the core universe. Dodge Construction Costs have the lowest cross-correlations indicating that this variable makes a unique contribution to total costs.

Table F. Cost of Living Data Organization and Regression Summary

AVAILABILITY AND ORGANIZATION OF DATA

City Grouping	Number of Cities	Data Set (by source) Availability			
		Home Ownership			Consumption
		Dodge	+	HUD	ACCRA
#3	90	YES	+	YES	
#1 Core universe	150	YES	+	YES	YES
#2	60	YES			YES
#4	280	YES			

REGRESSION ANALYSES OF THE CORE UNIVERSE

Estimation Equations		R^2	Standard Deviation	Accuracy Level
Core Universe	Empirical measurement	-----	0.0	1
City Gp #2	C&H = .345 x Dodge + .234 x Consumption + .465	.8725	2.7	2
City Gp #3	C&H = .396 x Home ownership +61.3	.8234	3.9	3
City Gp #4	C&H = .603 x Dodge + 40.5	.7684	5.4	4

R-square values indicate the "goodness of fit" of the straight line prediction equation to the actual observed values. It indicates the degree to which the prediction equation "explains" variance in the dependent variable (C&H costs), or, more simply, the accuracy of the prediction. High R-square values mean that differences between predicted and actual values will be small. This difference is measured by the standard

deviation.

A standard deviation of 2.7 index points, for locations in city group #2, as an example, means that the predicted C&H costs for 68 percent of the cities within the group are expected to be within + or - 2.7 index points of the actual costs if the actual costs are normally distributed. An additional 27 percent of the cities in the group will likely have predicted costs between + 2.7 and + 5.4 index points above actual values, or between -2.7 to -5.4 index points below actual values. An additional five percent of the city predicted costs are expected to vary from actual values by + or - 5.4 index points or more. The assigned accuracy levels--2, 3, and 4, reflect larger standard deviations and hence an increasing range of expected deviation of predicted values from actual values.

Figures A-1, A-3, and A-5, "Predicted Versus Actual C&H Costs, Core Universe," presents a plot of predicted versus actual core universe C&H values, the predicted values from the estimation equations for city groups #2, #3, and #4, respectively. Figures A-2, A-4, and A-6, "Predication Error Versus Actual C&H Costs, Core Universe," presents a plot of the difference between predicted and actual C&H values from the estimation equations for the city groups as above.

The later three even numbered figures indicate that the predicted values for C&H costs, for all three estimation equations, tend to be more frequently under-predicted for high absolute values; and more frequently over-predicted for low absolute values.[1] This means that the predicted city values for Consumption and Home Ownership have a tendency to exhibit less deviation from the average, than likely actual values. Thus the predicted high CLIs of this study are probably slightly low; the predicted low CLIs probably slightly high.

---

[1] This systematic error suggest that the relationships between the independent variables and the C&H costs dependent variable used to establish the estimation equation are not linear. Non-linear regression could be used to reduce these errors of prediction.

Table A-1. Statistics of Distribution

```
. summarize
```

varname	Obs	Mean	Std. Dev.	Min	Max
CandH	6	21.6666667	1.50554531	19	23
Home	6	35.5	1.87082869	33	38
Consump	6	41.8333333	6.73547821	29	47
Dodge	6	55.8333333	5.77638872	49	62

Table A-2. Correlation Matrix

```
. corr
(obs=6)
```

	CandH	Home	Consump	Dodge
CandH	1.0000			
Home	-0.6391	1.0000		
Consump	-0.0066	0.5000	1.0000	
Dodge	-0.0077	0.6570	0.8268	1.0000

Table A-3. Regression Analysis, City Group #2
Dependent variable: CandH
Independent variables: Consump and Dodge

```
. regress CandH Consump Dodge
(obs=6)
```

Source	SS	df	MS		
Model	.000668003	2	.000334001	Number of obs =	6
Residual	11.3326653	3	3.77755511	F(2, 3) =	0.00
				Prob > F =	0.9999
Total	11.3333333	5	2.26666667	R-square =	
				Adj R-square =	
				Root MSE =	1.9436

Variable	Coefficient	Std. Error	t	Prob > |t|	Mean
CandH					21.66667
Consump		.2293987	-0.001	0.999	41.83333
Dodge		.2674872	-0.007	0.995	55.83333
_cons		8.875965	2.453	0.091	1

Table A-4. Regression Analysis, City Group #3
Dependent variable: CandH
Independent variable: Home

```
. regress CandH Home
(obs=6)

   Source|       SS       df       MS              Number of obs =       6
---------+------------------------------           F(  1,     4) =    2.76
   Model|  4.62857143     1  4.62857143            Prob > F      =  0.1719
Residual|   6.7047619     4  1.67619048            R-square      =
---------+------------------------------           Adj R-square  =
   Total|  11.3333333     5  2.26666667            Root MSE      =  1.2947

 Variable|  Coefficient   Std. Error      t     Prob > |t|      Mean
---------+--------------------------------------------------------------
   CandH|                                                      21.66667
---------+--------------------------------------------------------------
    Home|      .3094872     -1.662     0.172          35.5
   _cons|      10.9995      3.630     0.022             1
---------+--------------------------------------------------------------
```

Table A-5. Regression Analysis, City Group #4
Dependent variable: CandH
Independent variable: Dodge

```
. regress CandH Dodge
(obs=6)

   Source|       SS       df       MS              Number of obs =       6
---------+------------------------------           F(  1,     4) =    0.00
   Model|  .000666001     1  .000666001            Prob > F      =  0.9885
Residual|  11.3326673     4  2.83316683            R-square      =
---------+------------------------------           Adj R-square  =
   Total|  11.3333333     5  2.26666667            Root MSE      =

 Variable|  Coefficient   Std. Error      t     Prob > |t|      Mean
---------+--------------------------------------------------------------
   CandH|                                                      21.66667
---------+--------------------------------------------------------------
   Dodge|      .1303151     -0.015     0.989      55.83333
   _cons|      7.308302      2.980     0.041             1
---------+--------------------------------------------------------------
```

Figure A-1. Predicted Versus Actual Consumption & Home Ownership Costs, City Group #2 estimation equation

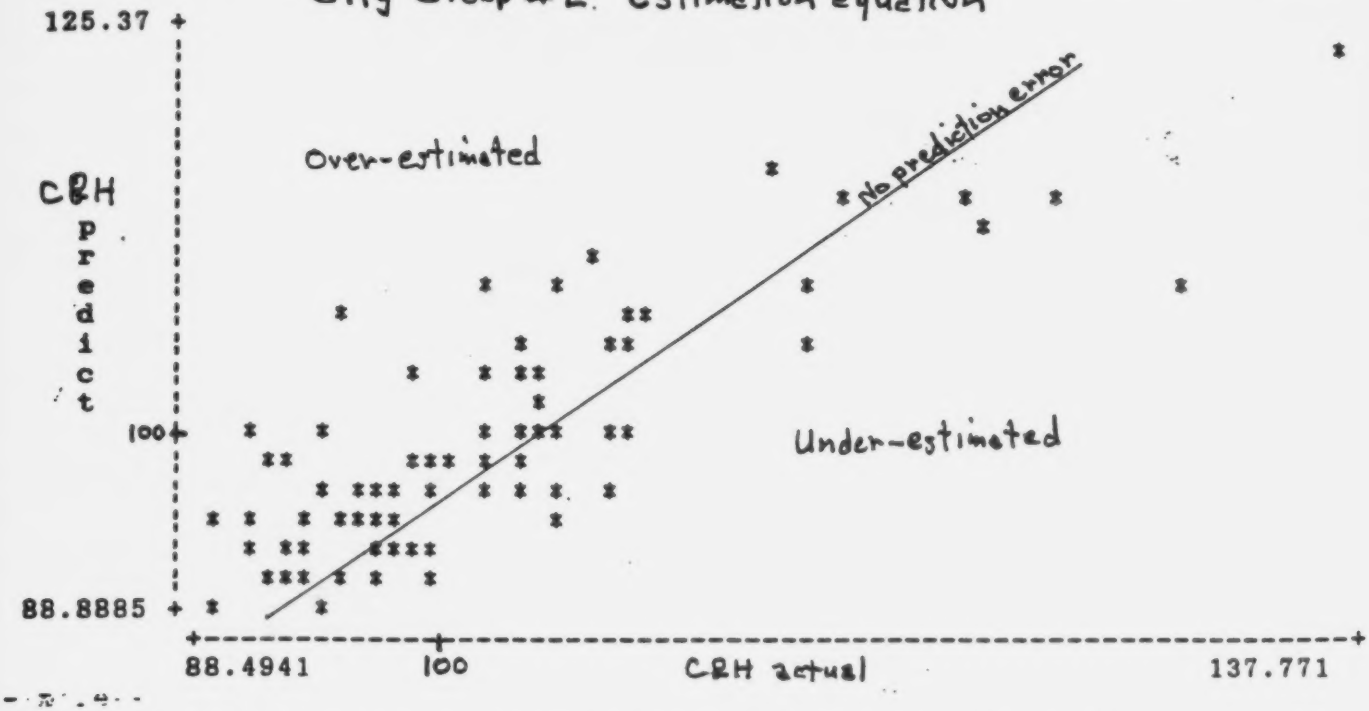
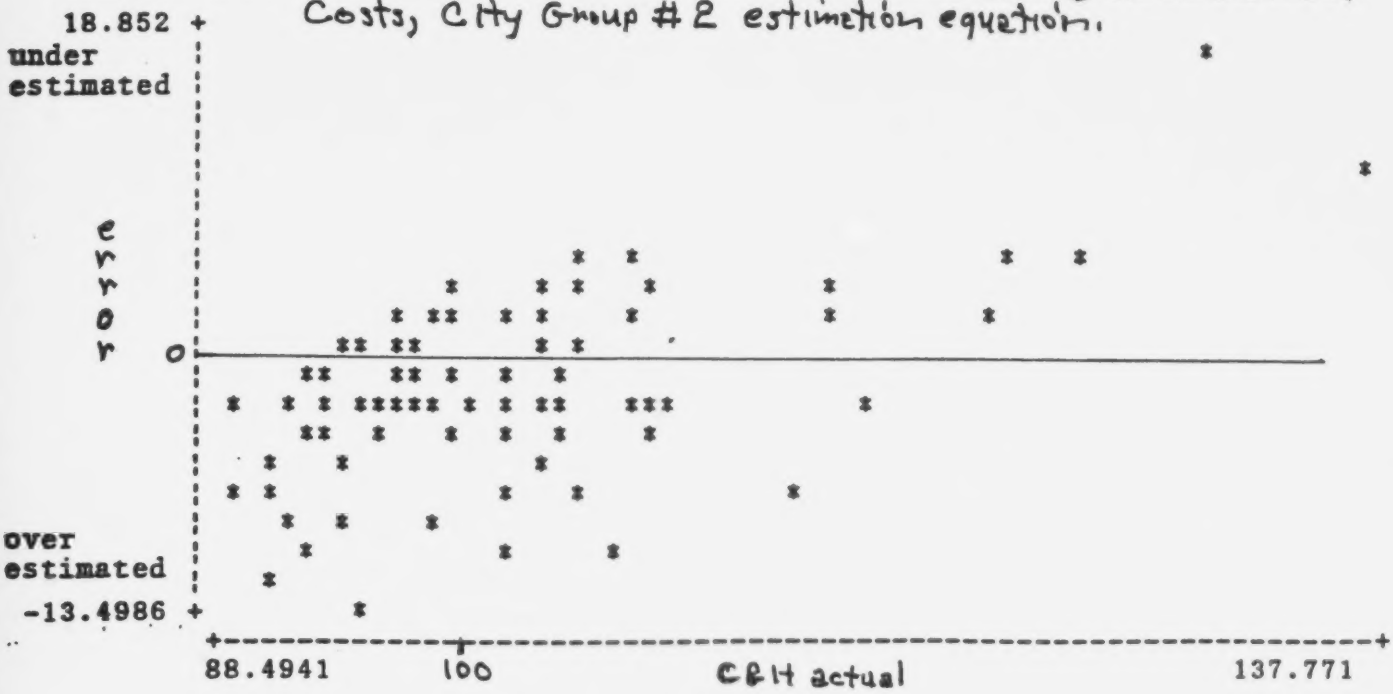


Figure A-2. Prediction Error Versus Actual Consumption & Home Ownership Costs, City Group #2 estimation equation.



Error = Actual C&H − predicted C&H

Figure A-3. Predicted Versus Actual Consumption & Home Ownership Costs, City Group # 3 estimation equation

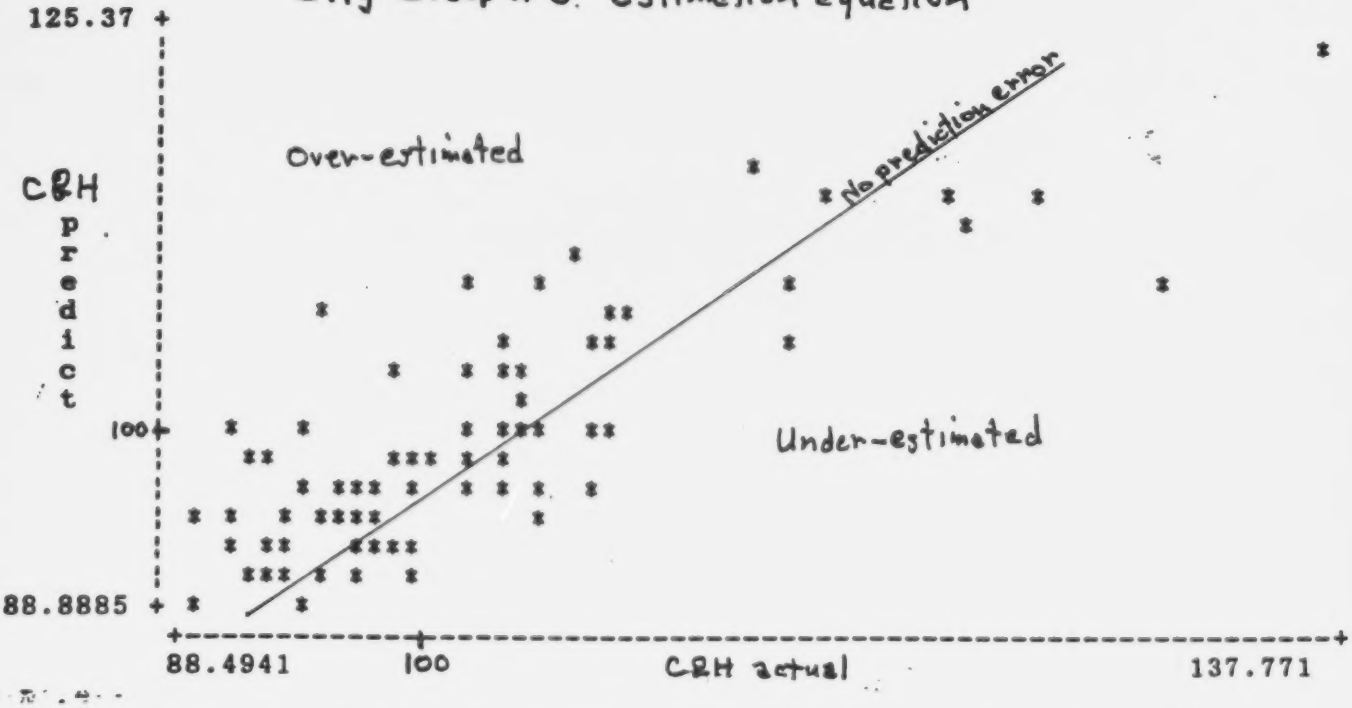
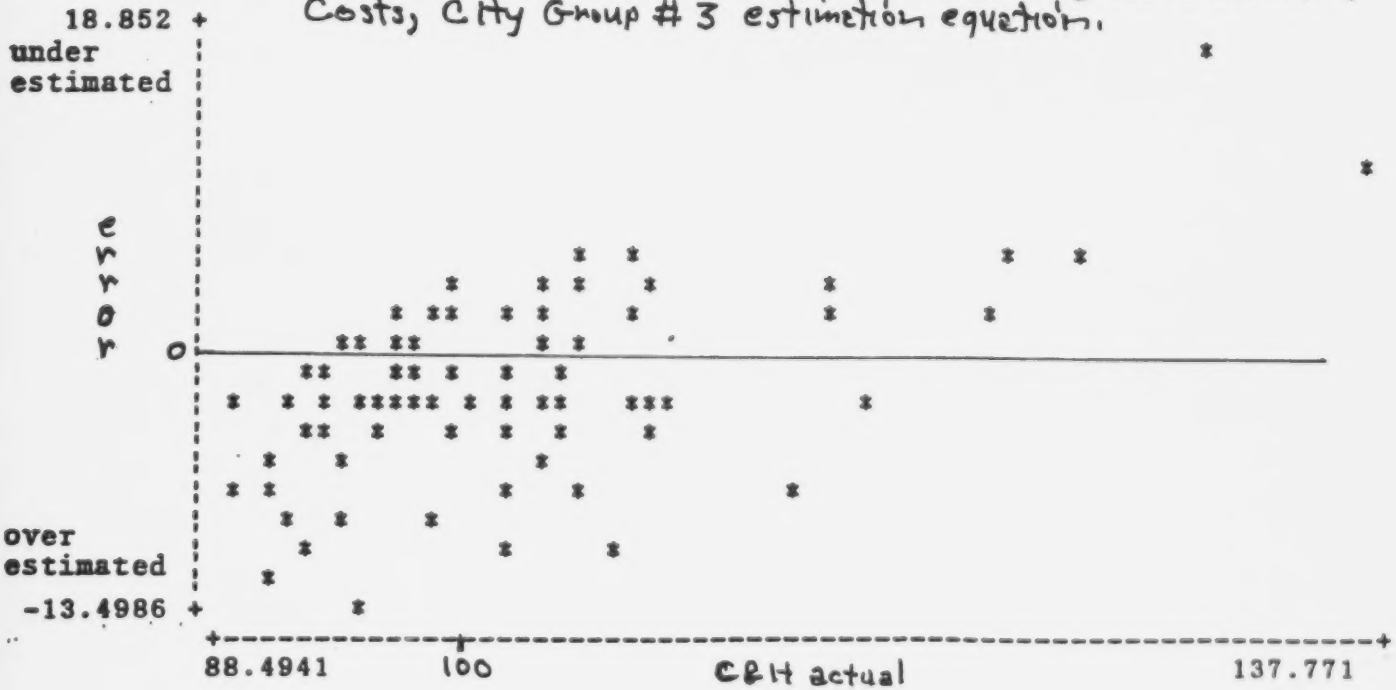


Figure A-4. Prediction Error Versus Actual Consumption & Home Ownership Costs, City Group # 3 estimation equation.



Error = Actual CBH − predicted CBH

Figure A-5. Predicted Versus Actual Consumption & Home Ownership Costs, City Group #4 estimation equation

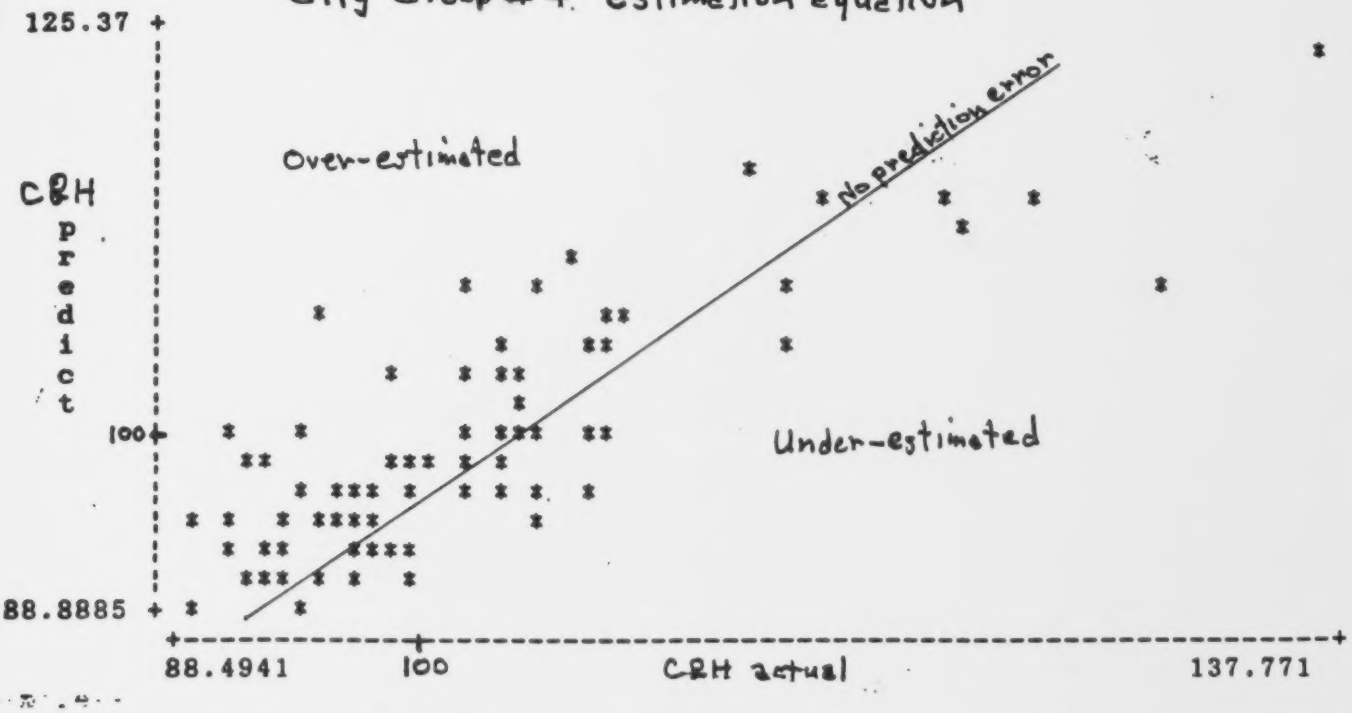
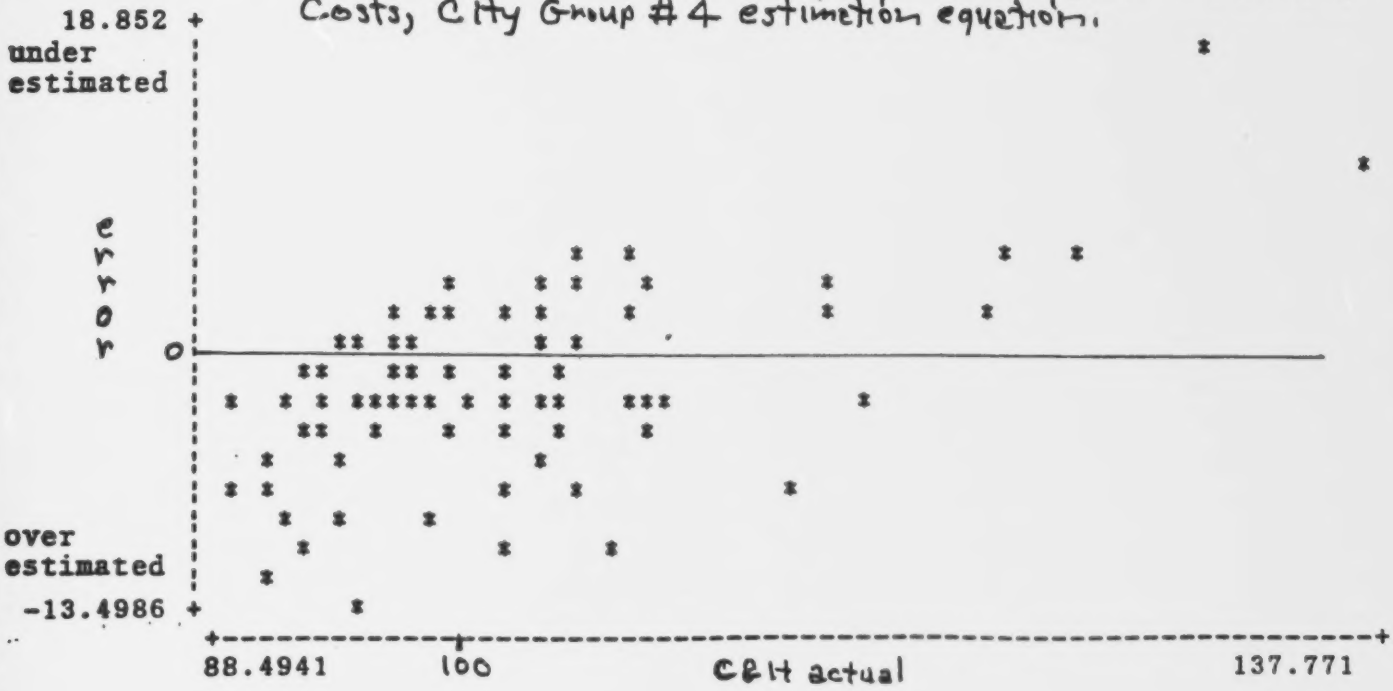


Figure A-6. Prediction Error Versus Actual Consumption & Home Ownership Costs, City Group #4 estimation equation.



Error = Actual CRH − predicted CRH

Appendix B: STATE AND LOCAL GOVERNMENT BUDGET

The market basket to be priced for the Cost of Government Services Index (Chapter 11) must be applicable to any of the jurisdictions involved. It must therefore reflect the general proportions and types of services common to all state and local governments, and be applicable to the range of population sizes and densities represented, and the specialized budget requirements imposed by environmental conditions. A single index can never be this representative. Most indexes are simply based on a national average budget. Such an index is applicable to any given location to the degree that the goods and services purchased by the jurisdiction are similar to the national average selection and mix. In most instances the similarities are sufficient to allow the index to be used for the financial adjustments intended.

It would be desirable to allow some latitude in budget composition to account for the special expenditure requirements in some jurisdictions. Snow removal, for example, and other costs imposed by climate, security, and natural phenomenon are not geographically uniform, yet they are legitimate, if inconsistent, budget items for many state and local governments. It is sound economics to compare the prices of market baskets so adjusted, if the jurisdictions involved believe the alterations more accurately reflect true site conditions. Rarely, if such costs are completely supplemental, i.e., not covered in existing budget categories, the expenditure amount should be <u>added</u> to the budget.[1] If the costs more likely reflect a variation in operations, such as air cooling rather than heating, the item should be <u>substituted</u> in the budget. Changes of this nature in the size or composition of the budget generally have little effect on overall index values because of the usual small weights involved. However, in a few instances some conditions such as property insurance in areas of severe earthquake potential, can add significantly to the costs of providing public services. The Cost of Government Services Index developed here has no individual city or state adjustments of this type.

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[1] Every type of state and local government expenditure is covered in the national budget. Many fairly common but not uniform expenditure items such as snow removal are thus adequately taken into account in a national <u>average</u> budget. An item may be <u>added</u> to the national budget for a limited number of jurisdictions only when the cost load involved is truly exceptional. Property insurance costs against earthquake damage in parts of California, for example, are substantially greater than evident from pricing the small insurance component of the national average budget.

The market basket used in index construction may be based on a physical count of items purchased, or, the budget proportions expended for each item may be substituted as a proxy without error, provided prices changes are expressed as relatives (percentages). The use of budget proportions avoids the difficult and time consuming task of a physical count. Since a geographical price index is fixed in time for a given year, a Paasche or variable-weight approach is required (as opposed to a Laspeyres-type, or fixed weight applicable to a time series inflation index). The budget proportions must be altered periodically to reflect changes in average purchase patterns, i.e., in physical count mix. Also, since prices of the various items will fluctuate, the budget proportions will change without a change in physical count proportions. This requires that the budget proxy be periodically adjusted to exclude inflationary changes.

The composition of expenditures for the current operations[2] of state and local governments is shown in Table B-1. Weights for the major divisions were derived from National Income Accounts data, Bureau of Economic Analysis, U.S. Department of Commerce. Subdivision weights were derived from median values of a number of state budgets secured from the National Association of State Budget Officers. The dominance of salaries and wages and related personal service expenditures in the budgets demonstrates the labor intensive nature of state and local government operations.

For pricing purposes budget items are organized by market as shown in table B-2. Five markets are represented: the labor market for pricing salaries, wages, and benefits of state and local government employees; the contracted services market for pricing personal and other contracted services; the energy market for pricing electricity, heating, and motor fuels; the consumer market for pricing goods purchased from local retailers and wholesalers; and the national market for pricing those few goods and services purchased from national distributors with minimal

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[2] Excluded from the budget are capital (including equipment) investment, and governmental activities where current revenues substantially cover costs, i.e., government sales* (school lunch program, higher education auxiliary enterprises, trash collection, natural resources, etc.), and government enterprises (government operated utilities, public transit systems, public housing, toll roads and parking, liquor stores, lottery, etc.). Also excluded are direct assistance and subsidies to the public, and Medicaid. * Where expenditures exceed sales, net expenditures are shown.

geographical price difference.[3]

Total current operations from Table B-1, excluding interest,[4] is shown in column 1. Columns 2 and 3 report the current operating budgets (similarly organized) for the two dominant[5] public services--elementary-secondary schools and higher education--respectively. The budget weights for the COG were estimated from all three distributions, taking into account the inclusion of additional energy and material proportions in the total budget for highways and utilities not covered by COGS. The weights selected as a national average for government human services are labor, 76 percent; contracted services, 8 percent; energy, 5 percent; consumer, 9 percent; and national, 2 percent. Calculation of specialized indexes using the school and higher education distributions resulted in no significant state-by-state departures from index values derived from this selected COGS mix.

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[3] Only a few items purchased by state and local governments are in this national market category. Postage is. So are long distance telephone, air travel, and books and periodicals sold by national publishing firms. This category may also include certain national brand supplies and materials sold through limited distributorship. Certain major equipment manufacturers may charge standard prices for repair services. The exact proportion of state and local government budgets subject to national market pricing is unknown. For purposes of index construction, it is assumed that about one-fourth of supplies and materials, small equipment replacement, and library materials are in this category.

[4] Payment of interest has been excluded from the simplified budget although normally classified as a current operating expenditure. The importance of interest payments in government total and specific function budgets varies greatly depending on local borrowing policy and size of construction programs. Because of this variance it is appropriate to exclude interest payments from comparison of program costs and consequently this factor is excluded from the Cost of Government Services Index.

[5] The relative importance of the labor component of public services (excluding direct assistance, subsidies, and highway material) is shown by the following 1982 full-time-equivalent employment distribution of state and local governments: education, 48.2%; health and hospitals, 12.1%; police and fire protection, 7.7%; highways, 4.7%; public welfare, 3.5%; local utilities, 3.4%, other and un-allocable, 20.4%. Source: Bureau of the Census, U.S. Department of Commerce, Historical Statistics on Governmental Finances and Employment, Census of Governments, Volume 65, Topical Studies, Number 4 (Washington, D.C.: GPO, 1982).

Table B-1
Estimated Composition by Object Category of Current Operation[1] Expenditures of State and Local Governments, 1984.

Category		Percent of total expenditures
Salaries and Wages[2]		52.0*
Benefits and Retirement		12.7*
Professional Services		2.7
Consumable Supplies and Materials		7.5
Office	0.9	
Machinery and Equipment Operation	0.6	
Medical, Chemical, Research	1.2	
Food	0.5	
Building and Roads	4.3	
Current and Recurring Operating Expenses		15.7
Travel and Per Diem	0.9	
Contracted Maintenance and Repair	2.3	
Postal, Telephone, Communications	2.0	
Water and Sewerage	1.5	
Rent	1.5	
Energy	6.2	
Contracted Services	1.0	
Other	0.3	
Interest		9.4*

---

[1] Current operations exclude capital and equipment investment, government sales and enterprises, direct assistance and subsidies, and Medicaid. See text footnote 1.

[2] The percent distribution of employees by occupation for state and local governments are as follows: professional specialty including faculty and teachers, 35%; administrative support including clerical, 18%; protective service including police and fire fighters, 15%; executive, administrative, and managerial, 9%; service except protective, 6%; technicians, 3%; all other, 13%. Source: Bureau of the Census, U.S. Department of Commerce, Detailed Characteristics of the Population, Chapter D, U.S. Summary, 1980 Census of the Population (Washington, D.C., GPO).

Sources: * identified percentages were derived from National Income Accounts data, Governments Division, Bureau of Economic Analysis, U.S. Department of Commerce, Washington, D.C., David Levin, contact. Other percentages derived from median values of individual state budgets classified by object provided by the National Association of State Budget Officers, Washington, D.C.

Table B-2
Distribution of Simplified State and Local Government Total, School, and Higher Education Current Operations Budgets Classified by Object for Pricing Purposes, 1984.

Market	Budget Object	Total State & Local Govt	School	Higher Education
Labor	Salaries and wages	56.3%		
	Professional	----	52.3%	46.8%
	Non-professional	----	11.9	14.5
	Benefits and retirement	13.7	13.7	17.2
	Total	70.0	77.9	78.5
Contracted Services	Professional, technical, & skilled services	6.4	3.3	3.7
	Communications	2.2	0.8	1.0
	Rent, insurance, other	2.0	3.4	---
	Water and sewerage	1.7	0.2	0.2
	Total	12.3	7.7	4.9
Energy	Prime fuel, electricity, auto fuel	7.6	3.7	6.1
Consumer	Supplies & materials	8.1	6.9	3.9
	Small equip replacement	---	0.6	2.1
	Library materials	---	1.2	2.5
	Total	8.1	8.7	8.5
National	Supplies & materials, small equip replacement, library materials	2.0	2.0	2.0

Weights for human services selected for Cost of Government Services Index: Labor, 76%; Contracted services, 8%; Energy, 5%; Consumer, 9%; and National, 2%.

Note: Fiscal data to be adjusted using COGS must pertain to state and local government current operations in provision of public human services and relate to expenditures for the above object type classifications. Excluded are interest, capital investment, equipment expenditures, and direct aid or subsidies to the public.

Sources: Total state and local government budget derived from National Income Accounts data and individual state budgets, see Table B-1. School and higher education budgets updated (based on application of individual item inflation rates) from Kent Halstead, Inflation Measures for Schools and Colleges, National Institute of Education, U.S. Department of Education, Washington, D.C.

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TABLES

Table 1. Cost of Living, Value of Amenities, Equilibrium Wages, and Cost of Public Services, by City and State, 1986-87.
All indexes are based on a U.S. population weighted average = 100
There is some area and population overlap.
Estimation accuracy 1-4, high to low.
CPS = .84 x EW + .09 x consumption + .05 x utilities + .02 x 100

State		City or Urban Area	County	MSA or County 1980 Population	COST OF LIVING INDEX	AMENITY INDEX	EQUILIBRIUM WAGES	COST OF PUBLIC SERVICE	CLI & EW Estimation Accuracy
Alabama	MSA	Anniston, Bynum	Calhoun	119,761	87	21	92	92	1
Alabama		Ashland	Clay	13,703	90		94	94	4
Alabama	MSA	Birmingham	Jefferson	883,946	92	33	96	96	1
Alabama		Brent	Bibb	15,723	90		94	94	4
Alabama	MSA	Dothan	Houston	122,453	92		96	96	2
Alabama	MSA	Florence	Lauderdale	135,065	86	29	91	91	1
Alabama	MSA	Gadsden	Etowah	103,057	87	28	92	92	1
Alabama	MSA	Huntsville	Madison	196,966	90	29	94	93	1
Alabama	MSA	Mobile	Mobile	443,536	92	34	96	96	1
Alabama	MSA	Montgomery	Montgomery	272,687	90	41	94	94	1
Alabama		Munford	Talladega	73,626	90		94	94	4
Alabama		Selma	Dallas	26,684	90		94	94	4
Alabama	MSA	Tuscaloosa	Tuscaloosa	137,541	87	28	92	92	3
ALABAMA		Total pop 3,894,046		2,544,948	90		95	94	
Alaska	MSA	Anchorage	Anchorage	174,431	128	287	116	117	1
Alaska		Fairbanks	Fairbanks	22,645	127		116	119	2
Alaska		Juneau	Juneau	19,528	127		116	119	2
ALASKA		Total pop 401,851		216,604	128		116	117	
Arizona		Casa Grande	Pinal	90,918	94		95	95	4
Arizona		Douglas	Cochise	80,717	95		96	95	4
Arizona		Flagstaff	Coconino	74,947	100		101	100	4
Arizona		Kingman	Mohave	55,693	90		91	90	4
Arizona	MSA	Phoenix	Maricopa	1,509,052	98	95	98	98	1
Arizona		Prescott	Yavapai	68,145	99		101	100	4
Arizona	MSA	Tucson	Pima	531,443	92	81	93	92	1
Arizona		Yuma	Yuma	90,554	101		102	101	4
ARIZONA		Total pop 2,718,425		2,501,469	96		97	97	
Arkansas		Batesville	Independence	30,147	81		84	85	4
Arkansas		Blytheville	Mississippi	59,517	88		92	92	4
Arkansas		El Dorado	Union	49,988	89		93	93	4
Arkansas	MSA	Fayetteville	Washington	100,494	87	33	91	91	1
Arkansas		Forest City	St. Francis	30,858	88		92	92	4
Arkansas	MSA	Fort Smith	Sebastian	131,822	88	35	92	92	1
Arkansas		Hot Springs	Garland	69,916	89		93	93	4
Arkansas		Jonesboro	Craighead	63,016	88		92	92	2
Arkansas	MSA	Little Rock	Pulaski	474,484	92	41	95	95	3
Arkansas	MSA	Pine Bluff	Jefferson	90,718	88	36	92	92	1
ARKANSAS		Total pop 2,286,357		1,101,860	90		93	93	
Calif	MSA	Bakersfield	Kern	403,089	100	103	100	99	3
Calif		Bishop	Inyo	17,895	106		104	103	4
Calif	MSA	Chico	Butte	143,851	103	108	102	102	1
Calif		Eureka	Humboldt	108,525	105		102	102	4
Calif		Fairfield, Vacavle, Elmra	Solano	235,203	108	178	104	104	3

Table 2. Consumption, State Income Tax Rate, Cost of Living, Value of Amenities, and Equilibrium Wages by City, 1985-87.

All indexes are based on a U.S. population weighted average = 100.

State		City or Urban Area	County	MSA or County Population	COST OF CONSUMPTION INDEX	STATE INCOME TAX RATE	COST OF LIVING INDEX	VALUE OF AMENITIES Site Index	% Adjustment Actual	% Adjustment Est	EQUILIBRIUM WAGES (CLI x % Adj)
Alabama	MSA	Anniston, Bynum	Calhoun	119,761	85	2.4%	87	21	105.4%		92
Alabama		Ashland	Clay	13,703	88	2.4%	90			104.7%	94
Alabama	MSA	Birmingham	Jefferson	883,946	90	2.4%	92	33	104.4%		96
Alabama		Brent	Bibb	15,723	88	2.4%	90			104.7%	94
Alabama	MSA	Dothan	Houston	122,453	91	2.4%	92			104.7%	96
Alabama	MSA	Florence	Lauderdale	135,065	84	2.4%	86	29	105.0%		91
Alabama	MSA	Gadsden	Etowah	103,057	85	2.4%	87	28	104.9%		92
Alabama	MSA	Huntsville	Madison	196,966	89	2.4%	90	29	104.7%		94
Alabama	MSA	Mobile	Mobile	443,536	91	2.4%	92	34	104.3%		96
Alabama	MSA	Montgomery	Montgomery	272,687	89	2.4%	90	41	103.9%		94
Alabama		Munford	Talladega	73,826	88	2.4%	90			104.7%	94
Alabama		Selma	Dallas	26,684	89	2.4%	90			104.7%	94
Alabama	MSA	Tuscaloosa	Tuscaloosa	137,541	85	2.4%	87	28	105.0%		92
Alaska	MSA	Anchorage	Anchorage	174,431	138	0.0%	128	287	91.2%		116
Alaska		Fairbanks	Fairbanks	22,645	138	0.0%	127			91.2%	116
Alaska		Juneau	Juneau	19,528	137	0.0%	127			91.2%	116
Arizona		Casa Grande	Pinal	90,918	95	1.7%	94			101.2%	96
Arizona		Douglas	Cochise	80,717	95	1.7%	95			101.2%	96
Arizona		Flagstaff	Coconino	74,947	102	1.7%	100			101.2%	101
Arizona		Kingman	Mohave	55,893	89	1.7%	90			101.2%	91
Arizona	MSA	Phoenix	Maricopa	1,509,052	99	1.7%	98	95	100.3%		98
Arizona		Prescott	Yavapai	68,145	101	1.7%	99			101.2%	101
Arizona	MSA	Tucson	Pima	531,443	92	1.7%	92	81	101.3%		93
Arizona		Yuma	Yuma	90,554	103	1.7%	101			101.2%	102
Arkansas		Batesville	Independence	30,147	78	1.8%	81			104.8%	84
Arkansas		Blytheville	Mississippi	59,517	87	1.8%	88			104.3%	92
Arkansas		El Dorado	Union	49,988	89	1.8%	89			104.3%	93
Arkansas	MSA	Fayetteville	Washington	100,494	86	1.8%	87	33	104.6%		91
Arkansas		Forest City	St. Francis	30,858	87	1.8%	88			104.5%	92
Arkansas	MSA	Fort Smith	Sebastian	131,822	87	1.8%	88	35	104.4%		92
Arkansas		Hot Springs	Garland	69,916	88	1.8%	89			104.3%	93
Arkansas		Jonesboro	Craighead	63,916	87	1.8%	88			104.3%	92
Arkansas	MSA	Little Rock	Pulaski	474,484	91	1.8%	92	41	103.9%		96
Arkansas	MSA	Pine Bluff	Jefferson	90,718	87	1.8%	88	36	104.4%		92
Calif	MSA	Bakersfield	Kern	403,089	102	1.3%	100	103	99.8%		100
Calif		Bishop	Inyo	17,895	110	1.3%	106			97.8%	104
Calif	MSA	Chico	Butte	143,851	105	1.3%	103	108	99.8%		102
Calif		Eureka	Humboldt	108,525	108	1.3%	105			97.8%	103
Calif		Fairfield, Vacavle, Elmra	Solano	235,203	112	1.3%	106	176	95.8%		104

Table 3. Cost of Consumption and Components, 1986

Note: See last page of table 3 for consumption formulas and estimation accuracy levels.

State		City or Urban Area	County	MSA or County Population	---CONSUMPTION--- Population Weighted	City Average	Annual property costs	New const costs	----------ACCRA data---------- Food	Utilities	Transportation	Health	Misc.	Estimation Accuracy Level
Calif	MSA	Fresno	Fresno	515,019	106	110	127	127	103.3	83.3	106.1	122.5	106.8	1
Calif	MSA	Los Angeles (1)	Los Angeles	7,477,421	111	116	154	128	96.2	106.4	106.1	116.2	103.4	1
Calif		Marysville	Yuba	49,733	109	114		122		85				4
Calif		Monterey	Monterey	290,444	113	117		128		85				4
Calif	MSA	Oakland, Newark	Alameda	1,761,751	121	126	161	135		85				3
Calif		Pacifica, El Granada	San Mateo	568,164	116	121		135		85				4
Calif		Palm Springs	Riverside	663,199	105	109		125	100.2	90.5	104.3	131.5	109.2	2
Calif		Placerville	El Dorado	85,812	109	114		122		85				4
Calif	MSA	Redding	Shasta	155,619	105	109	119	118		85				3
Calif		Redwood City, San Bruno	San Mateo	588,164	114	119		130		85				4
Calif	MSA	Sacramento	Sacramento	1,099,814	106	111	127	122	104.3	75.0	112.3	136.7	107.9	1
Calif		Saint Helena, Rutherford	Napa	99,199	112	117		127		85				4
Calif	MSA	Salinas	Monterey	290,444	118	122	153	128		85				3
Calif	MSA	San Bernardino, Barstow	San Bernardino	1,656,182	103	107	124	123	96.1	84.7	111.1	120.3	96.1	1
Calif	MSA	San Diego	San Diego (city)	1,861,846	116	121	163	126	101.5	67.4	129.5	128.2	105.0	1
Calif	MSA	San Francisco	San Francisco	1,468,671	123	128	166	135		85				3
Calif	MSA	San Jose	Santa Clara	1,295,071	113	118	178	131	99.4	55.9	110.5	126.8	101.9	1
Calif		San Luis Obispo	San Luis	155,345	111	115		125		85				4
Calif	MSA	Santa Barbara, Santa Maria	Santa Barbara	298,680	114	119	143	126		85				3
Calif	MSA	Santa Rosa, Bodega	Sonoma	299,827	120	125	160	127		85				3
Calif	MSA	Stockton	San Joaquin	347,342	108	113	129	122		85				3
Calif		Susanville	Lassen	21,661	109	113		121		85				4
Calif	MSA	Visalia	Tulare	245,751	101	105	114	120	97.4	96.8	106.4	108.3	102.8	1
Calif		Winters	Yolo	113,374	109	114		122		85				4
Colorado	MSA	Boulder, Allenspark	Boulder	189,625	99	102		110	103.4	75.4	108.9	119.6	98.8	2
Colorado		Castle Rock	Douglas	25,153	102	106		110		72				4
Colorado		Central City	Gilpin	2,441	102	106		110		72				4
Colorado	MSA	Colorado Springs, Calhan	El Paso	309,424	94	98	108	116	94.9	61.2	108.4	113.0	93.5	1
Colorado	MSA	Denver	Denver	1,428,836	100	104	115	110	102.4	75.4	110.0	108.6	99.8	1
Colorado		Florissant	Teller	8,034	105	110		116		72				4
Colorado	MSA	Fort Collins	Larimer	149,184	95	99	104	104	100.1	73.4	103.2	108.1	98.9	1
Colorado		Grand Junction	Mesa	81,830	96	100		102	107.3	71.0	106.8	111.2	98.5	2
Colorado	MSA	Greeley	Weld	123,438	100	104	108	110		72				3
Colorado		La Junta	Otero	22,567	95	99		98		72				4
Colorado		Lake George	Park	5,333	105	110		116		72				4
Colorado		Montrose	Montrose	24,352	98	102		102		72				4
Colorado	MSA	Pueblo	Pueblo	125,972	92	95	101	105	101.2	67.1	96.2	96.8	98.0	1
Colorado		Sterling	Logan	19,800	102	106		109		72				4
Colorado		Strasburg	Adams	245,944	102	106		110		72				4
Colorado		Trinidad	Las Animas	14,897	96	100		99		72				4
Conn	MSA	Hartford	Hartford	807,143	109	113	113	108	105.1	141.8	104.4	128.0	111.7	1
Conn	MSA	New Haven, Waterbury	New Haven	761,325	108	113	122	109	103.1	129.7	102.3	131.1	107.7	1
Conn	MSA	Norwich, New London	New London	238,409	97	101	100	102		136				3

Table 4. Property Ownership Costs by City, 1985
Residential single family home.

Neighborhood location: 42% within city limits but not in city core, 53% suburban, 5% rural.

* Total annual cost = mortgage of 8% interest and principle rate on 80% of property value, plus property taxes.

State	City or Urban Area	SITE PRICE 7,700 sq ft lot $/sq ft	SITE PRICE 7,700 sq ft lot Dollars	CONSTRUCTION COST 1,600 sq ft house $/sq ft	CONSTRUCTION COST 1,600 sq ft house Dollars	PROPERTY VALUE Dollars	PROPERTY TAXES rate Percent	PROPERTY TAXES tax Dollars	TOTAL ANNUAL PROPERTY COST* Dollars	TOTAL ANNUAL PROPERTY COST* Index
Calif	Fresno	$2.68	$20,657	$50.03	$75,047	$95,704	0.84%	$808	$6,933	113
Calif	Los Angeles (1)	$4.96	$38,226	$50.47	$75,712	$113,937	0.98%	$1,122	$8,414	137
Calif	Marysville			$48.26	$72,391					
Calif	Monterey			$50.47	$75,712					
Calif	Oakland, Newark	$5.40	$41,580	$53.13	$79,696	$121,276	0.88%	$1,062	$8,624	144
Calif	Pacifica, El Granada			$53.13	$79,696					
Calif	Palm Springs			$49.15	$73,719					
Calif	Placerville			$48.26	$72,391					
Calif	Redding	$2.00	$15,400	$46.49	$69,734	$85,134	1.24%	$1,055	$6,804	106
Calif	Redwood City, San Bruno			$51.36	$77,040					
Calif	Sacramento	$2.74	$21,121	$48.26	$72,391	$93,512	1.04%	$968	$6,953	113
Calif	Saint Helena, Rutherford			$50.03	$75,047					
Calif	Salinas	$5.05	$38,888	$50.47	$75,712	$114,600	0.89%	$1,025	$8,259	136
Calif	San Bernardino, Barstow	$2.27	$17,463	$48.70	$73,055	$90,498	1.08%	$975	$6,767	110
Calif	San Diego	$5.88	$45,294	$49.59	$74,383	$119,677	1.07%	$1,284	$8,944	146
Calif	San Francisco	$5.70	$43,900	$53.13	$79,696	$123,596	0.96%	$1,186	$9,096	148
Calif	San Jose	$7.51	$57,827	$51.80	$77,704	$135,531	0.78%	$1,052	$9,726	159
Calif	San Luis Obispo			$49.15	$73,719					
Calif	Santa Barbara, Santa Maria	$4.18	$32,194	$49.59	$74,383	$106,578	0.94%	$1,006	$7,827	128
Calif	Santa Rosa, Bodega	$5.69	$43,785	$50.03	$75,047	$118,832	0.96%	$1,145	$8,751	143
Calif	Stockton	$2.96	$22,736	$48.26	$72,391	$95,128	1.02%	$966	$7,054	115
Calif	Susanville			$47.82	$71,727					
Calif	Visalia	$1.84	$14,913	$47.38	$71,063	$85,975	0.83%	$714	$6,216	101
Calif	Winters			$48.26	$72,391					
Colorado	Boulder, Allenspark			$43.99	$65,985					
Colorado	Castle Rock			$43.99	$65,985					
Colorado	Central City			$43.99	$65,985					
Colorado	Colorado Springs, Calhan	$1.48	$11,998	$45.60	$68,406	$79,672	1.01%	$808	$5,907	96
Colorado	Denver	$2.67	$20,535	$43.39	$65,085	$85,621	0.95%	$818	$6,297	103
Colorado	Florissant			$45.60	$68,406					
Colorado	Fort Collins	$1.85	$14,217	$41.18	$61,765	$75,982	1.08%	$821	$5,684	93
Colorado	Grand Junction			$40.29	$60,436					
Colorado	Greeley	$1.76	$13,514	$43.39	$65,085	$78,599	1.10%	$863	$5,894	96
Colorado	La Junta			$38.52	$57,780					
Colorado	Lake George			$45.60	$68,406					
Colorado	Montrose			$40.29	$60,436					
Colorado	Pueblo	$1.47	$11,311	$41.62	$62,429	$73,740	1.07%	$788	$5,507	90
Colorado	Sterling			$42.95	$64,421					
Colorado	Strasburg			$43.39	$65,085					
Colorado	Trinidad			$38.96	$58,444					
Conn	Hartford	$1.70	$13,108	$42.50	$63,757	$76,862	1.66%	$1,272	$8,191	101
Conn	New Haven, Waterbury	$2.17	$16,745	$42.95	$64,421	$81,167	1.86%	$1,508	$8,701	109
Conn	Norwich, New London	$1.30	$10,000	$40.29	$60,436	$70,436	1.40%	$986	$5,494	90